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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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76-1089. Anonymous. **Will Velsicol's grit crack Russel Train's 9 cancer principles?** *Farm Chem.* 139(2): 22-24; 1976.

Once again the U.S. Court of Appeals is reviewing an EPA decision. The Environmental Defense Fund is suing EPA for not suspending all uses of chlordane/heptachlor. Velsicol Chemical Company is battling to retain all uses. A report calling for abandonment of the 9 cancer principles of the EPA has recently been issued by the Council for Agricultural Science and Technology. Other scientific groups are reportedly ready to challenge the principles. The recent decision by Administrative Law Judge Perlman not to recommend suspension of the registrations of heptachlor and chlordane was mainly made due to inconclusive laboratory findings. The Judge stated that at this time technology is not in a position to establish a safe level of a carcinogen for man. The extrapolation of mouse data to man in this respect is questioned.

76-1090. Huff, J. E.; Wassom, J. S. (Biomed. Sci. Sect., Environ. Inform. System Office, Oak Ridge Natl. Lab., Oak Ridge, TN 37830). **Health hazards from chemical impurities: chlorinated dibenzodioxins and chlorinated dibenzofurans.** *Int. J. Environ. Stud.* 6(1): 13-17; 1974. (29 references)

The history of dioxin is reviewed. Bionetics Research Labs. reported in the late 1960s that 2,4,5-T was teratogenic to mice. Shortly thereafter it was discovered that the 2,4,5-T sample used in that particular study contained about 30 ppm TCDD. Thus, while major attention has been focused on the toxicity of a persistent pesticide, impurities which are in fact more toxic may have gone unnoticed. TCDD is perhaps the most potent small molecule toxin and teratogen presently known. Adverse effects exhibited in chickens, monkeys, dogs, guinea pigs, rats, and pigs were traced to a PCB contaminant, chlorinated dibenzofuran, present in some commercial PCBs. Occupational chloracne in 31 employees of chlorophenol producing factories was found to be caused by TCDD. The positive evidence implicating these compounds, in particular TCDD, as mutagenic in bacteria and teratogenic in mammals, is already conclusive and without doubt. Data incriminating the dioxins or furans as carcinogenic or carcinomimetic is presently lacking. Due to the chemical stability of TCDD and its lipophilic nature, the possibility exists that TCDD released into the environment could accumulate in food chains. TCDD does not leach in soils, does not reside in the economic portion of plants growing in contaminated soil, degrades to about 50% after 1 yr in soils, and does not result from microbial or chemical condensation of 2,4,5-T. Both chlorinated dibenzodioxins and dibenzofurans are unstable to light in the presence of organic substrates. Light provides a mechanism for rapid destruction. Most organisms which are capable of degrading other chlorinated hydrocarbons showed no ability to metabolize TCDD. These chemicals are implicated as potential health hazards. It has been recommended that 2,4,5-T be restored to use with some possible exceptions: a permissible residue should be allowed of not more than 0.1 ppm 2,4,5-T on edible parts of food products and in water for human consumption, and a limit of 0.5 ppm of TCDD contamination, except that in all formulations to be used around the home and recreational areas. TCDD contamination should be limited to 0.1 ppm.

76-1091. Murdoch, W. W. (Dep. Biol. Sci., Univ. California, Santa Barbara, CA 93106). **Diversity, complexity, stability and pest control.** *J. Appl. Ecol.* 12(3): 795-807; 1975. (35 references)

Ecological theory and field evidence about population stability can contribute to the design of crop systems. It is contended that: there is no good evidence supporting the diversity stability theory either in crop systems or in natural communities; that natural systems are more stable than crop systems in general due to the fact that their component species are coevolved; that crop systems differ so much from natural communities that different rules must govern the stability of each system; that in artificial systems some evidence indicates that physical and spatial complexity confers stability and that this might be a useful principle for crop systems; and that naturally diverse systems should be maintained as simplified natural systems are unstable. From the factors presented in this paper it is suggested that it is possible to design agroecosystems which would reduce the severity of insect pest problems. In order to pursue such a control strategy, the crop system should contain enough plant species to maintain continuity of the enemy species. It is noted that, unless additional species contribute to the action of natural enemies, the addition of diversity for diversity's sake is not likely to be a useful strategy in agriculture. The marked instability of agroecosystems in contrast with the stability of natural communities may result from the frequent disruption of crops by humans and from the lack in crop systems of co-evolutionary links between the interacting species. It is stated that natural communities, whose stability results from their complement of co-evolved species, provide a poor model for the design of crop systems. Similarly, laboratory and mathematical models, like agricultural systems, are relatively poor in co-evolved peculiarities, and such models may thus be useful in agricultural system studies.

76-1092. Feder, G.; Regev, U. (Dep. Agric. Resource Econ., Univ. California, Berkeley, CA 94720). **Biological interactions and environmental effects in the economics of pest control.** *J. Environ. Econ. Manag.* 2(2): 75-91; 1975. (27 references)

An economics-oriented pest control model is presented which incorporates both the environmental effect of pesticide residue and species interaction within the ecosystem. Biological and economical components of the system are described and an analysis made of the outcome of decentralized decision making. Decentralized decision making and centralized control are discussed. The untap-

ped biological equilibrium is compared with a decentralized solution of the pest control problem. The ecosystem consists of prey-predator populations with human interaction through pesticide usage. This outside control, which has as its aim the reduction of pest damage, results in 2 undesirable external effects: the reduction of beneficial predator population and environmental contamination. From the comparisons made in this study it is shown that, under certain conditions, myopic decision rules increase rather than decrease the pest damage. The user cost is shown to be crucial in determining the optimal centralized policy, and its relation to the various components of the system are analyzed. The components of the user cost are analyzed to determine the level of taxes or subsidies that will yield the optimal policy.

76-1093. E. G. Feldmann (Author address not given). **The lesson from kepone.** *J. Pharm. Sci.* 65(2): I; 1976.

In light of the vast contamination resulting from improper procedures used in the manufacture of kepone (chlordecone), this editorial calls for greater care on the part of the chemical and drug industry. As a result of the kepone incident, airborne contamination has spread to a radius of at least 60 miles, and a major seafood-producing waterway system has been closed to fishing. The full extent of the damage has not yet been assessed. Quite naturally the public has responded with mistrust and suspicion regarding the quality of various products on the market and of the companies which produce them. Before more serious incidents occur, it is urged that drug manufacturers in particular take precautions.

76-1094. Korchagin, V. N. (Plant Protection Station, Exhibition of USSR National Economy Achievements, USSR). **Gosudarstvennyy kontrol' za zashchitoy sel'skokhozyaystvennykh rasteniy. [State control of agricultural plant protection.]** *Khim. Sel'sk. Khoz.* 13(11): 878-879; 1975. (Russian)

The organization of state control of chemical plant protection in the USSR is described. Chemical plant protection is done according to the instructions and guidelines issued by the Institute of State Inspectors of Plant Protection in compliance with official regulations. Chemical plant protection is done first after its necessity is established, and after the population and different organs of the area in question are notified. Only persons familiar with the safety rules, and wearing protective clothing are permitted to handle pesticides. It is prohibited to use dressed seeds for human or animal consumption. It is prohibited to treat seeds of sunflower, pea, bean, soybean, coriander and other vegetables, medicinal herbs, or flowers with granosan or other organomercurial fungicides.

76-1095. Duke, T. W. (Gulf Breeze Environ. Res. Lab., Gulf Breeze, FL). **Criteria for determining importance and effects of pesticides on the marine environment: a brief overview.** *Mar. Technol. Soc. J.* 8(1): 21-22; 1974. (4 references)

The effect of pesticides has been studied through laboratory research, experimental ecosystems, and environmental studies. In laboratory research, the first step in assessing a candidate pesticide and its degradation products after they have been subjected to chemical characterization is to perform a standard bioassay. These tests are often termed acute because they are conducted for a short period of time in relation to the life span of the organism. Pesticides entering the environment can affect individual animals and also the communities of animals and the ecosystems. The construction of an experimental ecosystem allows studies of the interaction of several species of organisms and their substrates. Bioaccumulation data can be easily obtained by residue analysis of individual organisms in such environments. In the area of environmental studies, the surveillance and analysis of residues in and near the application area can give some insight concerning the effect of pesticides on non-target species.

76-1096. Harris, W. F. (Author address not given). **Poisons: could what you don't know kill your patients?** *Mod. Vet. Pract.* 55(12): 941-944; 1974.

The primary reason why poisonings go undetected in veterinary practice is a misunderstanding of the situations that lead to poisoning. Anyone dealing with toxicology problems must observe the obvious and anticipate the unexpected. Tentative diagnoses can be tested via the services of diagnostic laboratories, and when death is imminent, symptomatic therapy may be indicated to permit time for the utilization of laboratory procedures. Many poisonings can be prevented by the practitioner who offers advice concerning the handling of certain chemicals. Ingested poisons are the most common cause of toxicoses. In one case, three horses ingested a a portion of metaldehyde in a bran mash; horses are particularly sensitive to metaldehyde and two of the horses failed to recover from a dose of 0.1-0.2 g/kg. When DDT was withdrawn from the market, parathion was recommended to a cattleman for use in his orchards. He killed many of his cattle when he also used the parathion to replace DDT as a cattle dip. Veterinarians should be ready to offer appropriate advice in such cases and to involve themselves in nutritional counseling. When unfamiliar problems arise, it may be desirable to consult with someone with greater expertise in toxicology.

76-1097. Anonymous. **Alternative technologies urged in pesticide report.** *Nature (London)* 259(5543): 440-441; 1976.

A committee of the National Academy of Sciences has warned that unless alternatives to conventional chemical pesticides are swiftly developed and adopted, agricultural production in the United States could soon begin to suffer. The conclusion was reached based on the results of

a 3-yr study into the current state of the art in pest control. The study suggested that although chemical pesticides have served agriculture and public health programs, the problems of declining effectiveness warrant substantial expansion of present efforts to promote alternative technologies, including integrated pest management. With respect to specific alternatives, the "third generation" compounds have some desirable qualities, but resistance is likely to develop to them. Insect control via pathogens is especially promising but will require improved methods for culturing insect host tissues. The use of genetic techniques is also promising, but there are potential problems facing widespread use of such techniques. Basic research on organisms and ecosystems must be given more attention by government agencies. The Committee recommended against programs designed to eradicate individual pest species entirely in that such schemes are expensive and have limited chances for success. The appalling scarcity of data on pesticide use in the U.S. calls for more effort directed toward monitoring pesticide use.

76-1098. Anonymous. **Different degrees of hazard—25 facts about pesticides and health.** *Nursing Mirror* 138: 79; 1974.

The use of chemical pesticides exceeds one million tons/yr in the world, of which about 10% are used to control pests which may transmit disease. Each of these chemicals presents its own degree of hazard to man. Some of them, such as organochlorine insecticides and arsenic, can be stored for a while in the human body, then are slowly broken down and/or excreted. No evidence exists which demonstrates that the stored levels of organochlorine pesticides in the general population have produced any adverse effects. About half a million cases of acute accidental pesticide poisoning are estimated to occur each year with a mortality rate between 1 and 10%. These accidental poisonings are mostly caused by misuses of pesticides, by transport and storage accidents, and by failure to dispose of used containers safely. Poisonings have also occurred due to the consumption of grain intended to be used as seed and treated with a mercurial fungicide. Food-borne outbreaks of poisonings have occurred due to the gross contamination of food, usually flour, sugar, or rice, by spilled pesticides. Due to their persistence and effects on the environment, there is a tendency to use organochlorine pesticides less. Thus, there has been an increase in the use of more toxic organophosphorus and carbamate pesticides. The emergency treatment for poisoning with organophosphorus and carbamate chemicals is atropine in large doses. Legal controls on the use of pesticides have been instituted in many places, have been sponsored by both WHO and the Food and Agricultural Organization to educate people in the health apsects of pesticide usage, with particular emphasis on reducing the number of cases of acute accidental poisoning. Both WHO and FAO have given aid to countries to set up national systems for the control of pesticides.

76-1099. Stroud, R. F. (Chemagro Div., Mobay Chem. Corp., Kalamazoo, MI 49007). **What pest management means to industry.** *Proc. North Cent. Branch Entomol. Soc. Am.* 29: 41-44; 1974.

Definitions of pest management vary according to the interest and viewpoint of the person presenting them. Pest management should be directed towards the grower and the consumer of the foodstuffs which this grower produces. Unless the grower can produce a crop acceptable to the ultimate consumer and grown under conditions acceptable to the environment, the time and effort of pest management personnel has been wasted. Good pest management calls for putting together a balanced program of pesticide usage along with biological and other controls. Proper use of pest management in the apple programs should include destruction of abandoned orchards to keep pests out of the commercial production. In order for a pest management program to be successful, all interested parties must be included in its planning, experimentation, and execution. Growers, fieldmen, extension and research personnel from state and federal sources, as well as the pesticide industry must be involved from the beginning to the end. In order for the pest management programs to succeed it is also necessary for universities to turn out skilled and concerned individuals in the various disciplines which come into play in an integrated program.

76-1100. Hall, F. R. (Dep. Entomol., Ohio Agric. Res. Develop. Cent., Wooster, OH 44691). **Plant protection in the orchard ecosystem.** *Proc. North Cent. Branch Entomol. Soc. Am.* 29: 66-69; 1975. (7 references)

The economic aspect of modern orcharding has had an increasingly important role in crop protection schemes. Crop protection in the U.S. orchard is changing rapidly with increasing costs in material, equipment, and labor. Grower net dollar returns are based on both yield and quality. There is a potential for rapid increases in pest populations within the orchard, and diseases also pose a considerable threat to product quality and yield. The grower visualizes losses in allowing disease or insect pests to reduce the quality or yield of his crop; the losses are magnified by increased labor costs required to grade and remove injured fruits from the packing sheds. Thus, the grower will continue to follow the protective spray schedules which have proven to be effective for so many years. Decisions on pesticide use strategies are highly dependent upon pest populations and crop loss information. New economic decision theory models combined with biological input and practical sampling methods will advance the objectives of economic entomology.

76-1101. Milias, G. W. (EPA, 100 California St., San Francisco, CA 94111). **EPA—its impact upon California mosquito control.** *Proc. Pap. Annu. Conf. Calif. Mosq. Control Assoc.* 41: 1973.

Some strong legislation has been passed during recent years by the Congress of the U.S. in relation to environmental controls. EPA must try to inter-

pret what Congress really meant, then determine how this interpretation can be carried into effect without virtually attempting to shut down the world. Mosquito control agencies come into contact with the EPA in relation to changes in laws on insecticides and herbicides. Under the new law, two use categories for pesticides were established: general and restricted. Minimum standards for the certificiation of applicators are to be set by EPA and there will be separate standards for private and commercial applicators. This requirement for certification should reduce misuse of pesticides and eliminate or reduce pesticide accidents. The availability of the restricted category may make it possible for EPA to allow registration of a much needed product under this category, whereas, without this category, the product would not be acceptable for use at all.

76-1102. Brown, W. S. (Orange County Mosquito Abatement District, Santa Ana, CA 92702). **Trustees' concern over limitations of pesticide use.** *Proc. Pap. Annu. Conf. Calif. Mosq. Control Assoc.* 41: 39-40; 1973.

The position of a trustee for a district does not require that he be an expert in every field into which his job will take him. However, it does require that he obtain help from experts in each of these areas who can properly advise the trustee staff, thus allowing correct decisions to be made. It is suggested that, since the problem of a rapidly declining effective supply of acceptable insecticides, pesticides, larvicides, etc., seems to be the current state of affairs, the present approach to the problem of insect control should lie in a preventive program rather than a curative one. Various source reduction methods have been introduced which include any effort or act that will aid in the reduction or elimination of adult mosquito production from any body or container of water that is conducive to the breeding of mosquitoes. Source reduction methods include the following practices: physical control by design and construction of new facilities and by draining or filling of existing facilities; biological control by use of mosquitofish; operational control by management and maintenance of agricultural irrigation and waste disposal facilities in combination with weed control; and chemical control by use of moquito larvicides. The legal owner of property, which includes all public agencies, is to prevent mosquito production as the result of his operation or use of the land.

76-1103. Swift, J. E. (Agric. Extension Serv., 329 Univ. Hall, Berkeley, KA 94720). **Pesticides can be compatible with the environment.** *Proc. Pap. Annu. Conf. Calif. Mosq. Control Assoc.* 41: 41; 1973.

The environment is often injured by the improper use of chemicals. Some of these chemicals have been pesticides which have caused the death of large numbers of fish, the loss of geese through the ingestion of zinc phosphide-treated rodent bait, the loss of grebes due to concentration of DDD (TDE) in the food chain, the death of trout fry due to the passage of DDT from mother to egg, and the loss of wildlife due to destruction of unwanted vegetation along stream banks, thus reducing the cover, food, and habitat of the wild population. It is urged that with proper knowledge and consideration of the total effects of pesticides, they can be used safely and effectively. The benefit-risk equation must be considered in order to justify acceptance of a specific chemical at a particular time and place. Each substance must be evaluated for each case if protection of the environment is to be achieved.

76-1104. Dietrick, E. J. (Rincon-Vitova Insectaries Inc., Oak View, CA 93022). **Future pesticide methods when chemical uses are curtailed.** *Proc. Pap. Annu. Conf. Calif. Mosq. Control Assoc.* 41: 42; 1973.

Pest management based on biological control is not an eradiction approach to pest control. To be successful, pest management specialists must be able to integrate the cultural and biological controls and use chemicals only when necessary to guarantee the success of field situations. Problems must be solved on the site. Continuous monitoring to keep track of the populations is a must. Sampling involves studying the various organisms involved in the habitat and their relations. The three main components of a pest management program are: maximizing existing natural controls, mainly by cultural methods to prevent the buildup of pests; monitoring concentrations of pests and natural controls to determine the need for further measures; and using most appropriate techniques or combinations of techniques to suppress pests only when needed to prevent economic damage to the crop at hand.

76-1105. Carter, L. J. (Author address not given). **Pest control: NAS panel warns of possible technological breakdown.** *Science* 191(4229): 836-837; 1976.

Three major developments are challenging the effectiveness of chemical pest control. Genetic resistance has appeared in many target insect pests. Natural pest control mechanisms have often been disrupted by the killing of beneficial insects as well as target species. Recent laws and regulations adopted in the interest of environmental protection and occupational health and safety are increasingly constraining to the use of pesticides. Successful alternative strategies for the control of insects will require further use and development. Some such alternatives are the breeding of pest-resistant plants and introducing genetically modified pests, developing bacterial and viral agents to which farm pests are vulnerable, developing third-generation chemicals specifically designed to interfere with the biochemical systems of target pests while having little if any effect on vertebrates and other nontarget organisms, and employing ecology-based, integrated control strategies.

76-1106. Nisbet, I. C. T. (Author address not given). **Persistent pesticides and wildlife.** *Technol. Rev.* 77(6): 8-9,69; 1975.

Most pesticides, for their purpose as management tools, are crude and unselective. This is particularly true of the long-lived pesticides as they cannot be used with precise timing. There is no debate that these chemicals affect wildlife. The question to be considered in discussing these persistent chemicals is whether their special properties of persistence, mobilities, storage in organisms, and ecological magnification make them more damaging than nonpersistent alternative chemicals. It is this persistence which makes these particular chemicals convenient and cheap to use. Thus, the question has economic ramifications as well. Many examples of drastic effects caused by these chemicals are given. The key to such effects of DDT lies not only in its persistence, but also in its resistance to metabolism and consequent ecological magnification. The examples given indicate that the properties of persistence, storage, and biomagnification can make these chemicals especially hazardous to wildlife, even to animals exposed indirectly. The level of such chemicals in remote areas, far from application sites, is relatively low. Most of the effects are therefore sublethal, often subtle, functional changes.

76-1107. Nisbet, I. C. T. (Author address not given). **Banning DDT: An ill-planned biogeochemical experiment.** *Technol. Rev.* 77(2): 10-11; 1974.

The restrictions which have been imposed on pesticide and insecticide usage have come about for several reasons: the long life of these chemicals in the environment, their mobility and tendency to accumulate in plants and animals, their widespread occurrence in human food and human tissue, and their broad biological activity. Several of these pesticides have been declining in their effectiveness as the target insects develop resistance to them. There are arguments which state, however, that there are some uses for these chemicals in which the amount of chemical needed is so minor or in which the insecticides are so well contained that they lead to a risk low enough to be acceptable. Also, there is another argument which states that perhaps there are some uses so strongly beneficial that society should accept a finite risk. Perhaps the most difficult problem arising out of the use of such chemicals is that of calculating the relation between use and subsequent exposure. The tracing or prediction of the entire process of transport and transformation of a chemical, from its initial release into the environment to its ultimate degradation or sequestration, is complex. We are not yet able to specify with certainty the critical pathways of transport or transformation for any of the chemicals. One of the principal difficulties concerns the fact that human danger from exposure arises out of very minor mass flows. An additional complication is that none of the problems involves only one chemical. Environmental models which treat the mixtures as single substances may thus be seriously misleading. It is concluded that, until sounder predictions are possible, simple prudence requires that over-conservatism is necessary in regulating the use of these uncontrollable chemicals.

76-1108. Cubit, D. A.; Deichmann, W. B.; MacDonald, W. E. (Res. Teaching Cent. Toxicol., Univ. Miami Sch. Med., Coral Gables, FL 33124). **Determination of organochlorine pesticides in the tissues of the black mullet (*Mugil cephalus*) and the silver mullet (*Mugil curema*).** *Am. Ind. Hyg. Assoc. J.* 37(1): 8-15; 1976. (12 references)

As determined by gas-liquid chromatography, the mean monthly concentrations of total DDT in black mullet (*Mugil cephalus*) caught during 1973 and 1974 in shallow South Florida east and west coastal waters ranged as follows: 0.002-0.064 ppm in flesh, 0.002-0.156 ppm in liver, and 0.001-0.075 ppm in gonads (primary milt). In silver mullet (*M. curema*) the average residue levels were 0.014-0.101 ppm in flesh, 0.016-0.300 ppm in liver, and 0.045-0.0246 in milt. The concentrations of other organochlorine pesticides in these tissues were insignificant. There was evidence of a significant seasonal (May to September) increase in the tissue DDT concentration in the fish which was directly related to the increased runoff during the rainy season. The black and silver mullet, unlike the great barracuda (*Sphyraena barracuda*), did not lose their body fat and DDT-type pesticides during gonadal development.

76-1109. Kono, S.; Yamashita, M. (Hyogo Agric. Exp. Stn., Kitaoji, Akashi, Japan). **Decrease in residual amounts of diazinon in cabbages and soil after its application.** *Bochu-Kagaku (Sci. Pest Contr.)* 39(4): 119-125; 1974. (10 references)

The change is reported in residual amounts of diazinon in cabbages when applied at different dosages and at different intervals. Thirty-four % wettable powder of diazinon was diluted with water to 500-, 1,000-, and 2,000-fold, and 0.25 liter of each preparation was applied to each 1.5 × m^2 plot in which cabbages were planted. Cabbages were harvested at 1, 5, and 15 days after the last application and analyzed for diazinon residues. Those cabbages which were sprayed more frequently and those which received the higher concentrations of diazinon had larger amounts of residues. The amount of residue decreased as the length of time from last exposure to harvesting increased. When diazinon diluted to 1/1,000 was sprayed 2 and 3 times, the residues were 0.0006 and 0.09 ppm, respectively at 15 days after the last spray. There values were almost equal to those of plots where diazinon preparations of 1/500, 1/1,000 and 1/2,000 were sprayed only once and 132-146 days elapsed after spray and before harvest. These findings may be due to the fact that diazinon deposited on plant surfaces disappears rapidly by evaporation and washing-off by rain, and then gradually reduces by degradation. However, residues at a low level will be retained for a long time for the plants, while they are young, absorb chemicals through their roots from the soil. In experiments designed to test the effects of soil on pesticide residues, it was apparent that much more residue was retained in conglomeratic and glei clay loam than in loam. Residues in glei clay loam and sandy loam were comparatively high at the 170th day, 15-16%, whereas those from loam decreased rapidly during the first 15 days and then gradually throughout the whole period, and those in glu clay loam decreased rapidly during the first 35 days and then remained almost constant to day 170. Days required for 90% disappearance were 170 for sandy loam and 108 for glei clay loam.

76-1110. Clark, D. R., Jr.; Lamont, T. G. (U.S. Fish Wildlife Serv., Patuxent Wildlife Res. Cent., Laurel, MD 20811). **Organochlorine residues in females and nursing young of the big brown bat (*Eptisicus fuscus*).** *Bull. Environ. Contam. Toxicol.* 15(1): 1-8; 1976. (5 references)

The carcasses and brains of 18 big brown bats (*Eptisicus fuscus*) captured in Gaithersburg, MD, were analyzed for residues of organochlorine insecticides and PCB. Eleven of the bats were adult females, and the remaining seven were nursing young. The μg amounts of PCB and DDE in the carcasses were similar in the young and adult animals, but the concentrations were significantly higher in the young bats. The brains of three young bats contained detectable PCB and DDE residues. The younger adults contained higher PCB and DDE levels than the older ones, but among the oldest females, the levels appeared to be rising again. This pattern resembled that observed among free-tailed bats from Bracken Cave, Texas, but differed from the continuous linear decline pattern observed in a Laurel, MD, population of big brown bats. DDE was transferred more readily than PCB from female to young by nursing. Five of 51 neonatal big brown bats from the Laurel population were thought to have been born dead because of PCB residues that had been transferred across the placenta. Even greater amounts of PCB may be transferred to the young via lactation and nursing.

76-1111. Brodtmann, N. V., Jr. (Jefferson Parish Water Dep., Jefferson, LA 70181). **Continuous analysis of chlorinated hydrocarbon pesticides in the lower Mississippi River.** *Bull. Environ. Contam. Toxicol.* 15(1): 33-39; 1976. (4 references)

A continuous liquid/liquid extraction apparatus was used to monitor ng/liter levels of eight chlorinated hydrocarbon pesticides in the Mississippi River at the Jefferson Parish Waterworks, District No. 1. The sample periods were 7 days each. Of the eight compounds studied (γ-chlordane, lindane, heptachlor, heptachlor epoxide, dieldrin, endrin, *p,p'*-DDD (TDE), and *p,p'*-DDT), the only significant correlation observed was a negative one between the concentrations of heptachlor and heptachlor epoxide. The concentrations of all of the eight pesticides were continuously found in the ng/liter range. A minimum of 49.7 lbs of the eight pesticides (combined weight) was estimated to be introduced to the Gulf of Mexico each day. On an annual basis, this figure equates to a minimum of 9 tons/yr.

76-1112. Ernst, W.; Goerke, H.; Eder, G.; Schaefer, R. G. (Inst. Meeresforsch., Bremerhaven, Germany). **Residues of chlorinated hydrocarbons in marine organisms in relation to size and ecological parameters. I. PCB, DDT, DDE, and DDD in fishes and molluscs from the English Channel.** *Bull. Environ. Contam. Toxicol.* 15(1): 55-65; 1976. (9 references)

Gas chromatography was used to determine the residue levels of PCBs, DDT, DDE, and DDD (TDE) in yellow gurnard, (*Trigle lucerna* (Pisces)) plaice (*Pleuronectes platessa* (Pisces)), brill (*Scophthalmus rhombus* (Pisces)), squid (*Loligo forbesi* (Cephalopoda)), and queen scallops ((*Chlamys opercularis* (Bivalvia)) caught in the English Channel. In general, the residue concentrations increased with increasing lipid content in the tissues; however, the residue amounts per lipid weight were highest in the muscle tissues. Among the gurnard, the residue levels appeared to increase with body size, the age of the animal being of importance as well as the total lipid content. Among the squid, the residue concentrations in the muscle tended to decline with increasing animal size, but this correlation was not significant. The concentrations of PCB were always higher than those of total DDT, as indicated by PCB:total DDT ratios which ranged in general between 3 and 7.

76-1113. Miller, C. W.; Shafik, T. M. (Tech. Serv. Div., Off. Pestic. Programs, Environ. Protect. Agency, Washington, DC). **Concentrations of propoxur in air following repeated indoor applications.** *Bull. WHO* 51(1): 41-44; 1974. (9 references)

The insecticide propoxur was applied as two non-overlapping bands approximately 1 m wide to the interior of houses in El Salvador once every 35 days for a period of 9 months. Air samples were collected from the interior of the houses once every seventh day during the entire period. In the study area, air temperatures remain relatively constant, while rainfall varies seasonally. It was found that volatilization of propoxur, as determined by the amounts detectable in air, represented release of the chemical from the treated surface and that the volatilization process was most influenced by the amount of moisture present in the air. Higher air concentrations of propoxur occurred during periods of high relative humidity than in periods of low relative humidity. The principles involved in this process and its bearing on the value of propoxur in malaria control program are discussed. (Author abstract by permission)

76-1114. Vollner, L. (Ist. Chim. Ecol. Monaco, Baviera, Monaco). **Some chemical aspects of environmental quality.** *Cron. Chim.* 43: 3-8; 1974. (19 references)

Knowledge of various parameters is necessary to understand the hazards of chemicals to the environment: production and industrial waste, use patterns, persistence, dispersion tendencies, conversion under biotic and abiotic conditions, and biological consequences. Conversion under abiotic conditions is discussed and so, to a lesser extent, is the dispersion tendency. Environmental chemicals, after their application, are subjected to conversion in plants, warm blooded animals, insects, and microorganisms. Three conversion processes are of primary importance under atmospheric and terestial conditions. One is thermal, another is chemical (oxidation and hydrolysis of pesticides) and the third is photolytic, with ultraviolet light the most important component. Bridged isomerization products from cyclodiene insecticides have been found as residues on plants and in animal products, such as aldrin, isodrin, dieldrin, and endrin. The photochemical behavior of dieldrin, *cis*-chlordane, *trans*-chlordane, heptachlor, nonachlor, β-dihydroheptachlor, and chlordene was studied. It was concluded that upon irradiation with wavelengths above 300 nm, primarily half-cage compounds occur. Irradiation below 300 nm mainly causes dechlorination. In experiments using γ-irradiation, more and more hydrophilic components occurred with increasing irradiation. When the parent molecule is changed only to a certain extent by γ-irradiation, conditions favoring rapid microbial degradation may be achieved. It is noted that any proposals for the preservation and improvement of environmental quality can be successfully practiced only on a world-wide scale.

76-1115. Mackay, D.; Leinonen, P. J. (Dep. Chem. Eng. Appl. Chem., Univ. Toronto, Toronto, Ontario, Canada). **Rate of evaporation of low-solubility contaminants from water bodies to atmosphere.** *Environ. Sci. Technol.* 9(13): 1178-1180; 1975. (3 references)

Rates of evaporation are analyzed, including the liquid phase rates, to provide a realistic estimate of the rate of the total evaporation process of low-solubility compounds from the bulk of a water body to the atmosphere. Equations are presented which fit the physical model of well-mixed air and water phases separated by an interface with near stagnant films of air and water on either side. Most of the resistance to mass transfer lies in these films. This is probably the most simple but realistic model of mass transfer between the near surface regions of water bodies and the atmosphere. One equation represents a situation in which a water body becomes depleted of a compound introduced at a specific time point such as from an accidental spill. Another equation may be used to predict the steady state exchange rate of a compound between the atmosphere and a water body assuming that there is a constant rate of supply of material to one phase and removal from the other.

76-1116. Anonymous. **Quality assurance for groundwater.** *Environ. Sci. Technol.* 10(3): 226-227; 1976.

The Safe Drinking Water Act of 1974 (P.L. 92-523) provides a statutory mandate for the establishment of state programs for the protection of underground drinking water sources from subsurface injection and other means of introducing contaminants. The EPA administrator desig-

nates which states must formulate groundwater quality control programs, and if the programs designed by such states are unsatisfactory, EPA will organize and run a satisfactory one. Principal groundwater contaminants in the U.S. include those from oil and gas operations, waste brine, industrial waste injection wells, sewage, pesticides, fertilizers, and landfill leachates. Injection is now to be authorized by permits issued by the states or EPA, and the EPA Office of Water Supply (OWS) is concerned with all injection wells. WHO is also calling to establish worldwide methods, instrumentation, and data storage and retrieval systems for measuring and monitoring surface and ground water, and the National Water Well Association offers information and aid to the water well industry.

76-1117. Williams, P. M.; Robertson, K. J. (Inst. Marine Resources, Univ. California San Diego, La Jolla, CA 92037). **Chlorinated hydrocarbons in sea-surface films and subsurface waters at nearshore stations and in the north central Pacific gyre.** *Fish. Bull.* 73(2): 445-447; 1975. (8 references)

Electron capture gas chromatography was used to determine the content of *p,p'*-DDT, *p,p'*-DDE, and PCBs in surface films collected at coastal stations off southern California and Mexico, and in surface films, subsurface waters, and particulate matter from the North Central Pacific Gyre. In the North Central Pacific Gyre, the DDT concentration in the surface films and subsurface waters was always less than 0.03 ng/liter, while the PCB content was two orders of magnitude higher. The PCB concentration in the surface films was significantly higher than that in the subsurface waters. In the California and Mexico coastal waters, the PCB and DDT concentrations in the surface films were on the order of 11-90 ng/l and less than 0.03-15.4 ng/l, respectively. These values are slightly higher than those previously reported for the 1-2 m subsurface waters of the near-shore California Current.

76-1118. Bauer, U.; Pfleger, R. (Inst. Wasserforsch GmbH, Dortmund, Germany). **Eliminierung von einigen Pestiziden und Clophen A30 bei der Wasseraufbereitung durch Chlorung, Flockung und Aktivkohlefiltration.** [**Elimination of some pesticides and Clophen A 30 through water purification by chlorination, flocculation and activated charcoal filtration.**] *Gas-Wasserfach Wasser Abwasser* 116(12): 555-559; 1975. (33 references) (German)

The effect was studied of certain water treatment procedures on pesticides in solution. The water was subjected to chlorination, flocculation, and filtration through active carbon. Flocculation removed no dissolved organic compounds, but the iron ions hydrolyzed endothiodan. Chlorination was ineffective on the chlorinated hydrocarbons but did oxidize the phosphate and sulfite esters although no study was made of the breakdown products and their toxicity. Active carbon adsorbed all the pesticides and PCB. The pesticides in the test solution were 500 ppm diuron, 7390 ppm paraquat, 706 ppm malathion, 114 ppm Clophen A 30, and the purification procedure removed 98.2-99.9% of these substances.

76-1119. Barduta, Z.; Dumitrescu, H. (Hygiene and Public Health Institute, Bucharest, Romania). **Substante nocive in bauturi alcoolice.** [**Noxious substances in alcoholic beverages.**] *Igiena* 24(2): 119-123; 1975. (18 references) (Romanian)

A listing is provided for those testing alcoholic beverages for toxic substances, suggesting the various possibilities of contamination deriving from agricultural sources, manufacturing etc. Substances mentioned in the first category include fungicides (copper salts, dithiocarbamates, and sulfur compounds) and insecticides (arsenic derivatives, parathion, malathion, diazinon, carbamates, and kelthane).

76-1120. McKeller, R. L.; Dishburger, H. J.; Rice, J. R.; Craig, L. F.; Pennington, J. (Residue Res. Lab., Ag-Organics Dep., Dow Chem. Co., Midland, MI 48640). **Residues of chlorpyrifos, its oxygen analogue, and 3,5,6-trichloro- 2-pyridinol in milk and cream from cows fed chlorpyrifos.** *J. Agric. Food Chem.* 24(2): 283-286; 1976. (7 references)

Cows were fed a complete ratio containing chlorpyrifos at 5 levels from 0.3 to 30 ppm for 2 weeks at each level. Milk and cream samples were collected at predetermined intervals during the feeding of the chemical and for 14 days following withdrawal of the highest feeding level. Residues of chlorpyrifos (*O,O*-diethyl *O*-(3,5,6-trichloro-2-pyridyl) phosphorothioate) and its oxygen analogue (*O,O*-diethyl *O*-(3,5,6-trichloro- 2-pyridyl) phosphate) were determined by flame photometric gas chromatography and the 3,5,6-trichloro- 2-pyridinol (the principal degradate of chlorpyrifos) was determined as the trimethylsilyl derivative by electron capture gas chromatography. The methods were validated to 0.01 ppm for the three compounds in milk and 0.01 ppm for chlorpyrifos and its oxygen analogue and 0.025 ppm for 3,5,6-trichloro-2-pyridinol in cream with overall average recoveries of greater than 80%. The average residues found were 0.01 ppm of chlorpyrfos, < 0.01 ppm of chlorpyrifos oxygen analogue, and 0.01 ppm of 3,5,6-trichloro-2-pyridinol in milk and 0.10 ppm of chlorpyrifos, < 0.01 ppm of chlorpyrifos oxygen analogue, and < 0.025 ppm of 3,5,6-trichloro- 2-pyridinol in cream at the highest feeding level. Residues of all chemicals decreased rapidly upon removal of chlorpyrifos from the feed. (Author abstract reprinted by permission of the American Chemical Society)

76-1121. Mason, W. A.; Meloan, C. E.* (Dep. Chem., Kansas State Univ., Manhattan, KS 66506). **Degradation products of phoxim (Bay 77488) on stored wheat.** *J. Agric. Food Chem.* 24(2): 299-304; 1976. (18 references)

The pesticide Phoxim (Bay 77488) (gloxylonitrile phenyl oxime *O,O*-diethyl phosphorothioate) was found to

form two extractable products when placed on stored wheat—the oxygen analog and the *S*-ethyl isomer. The extraction solvent is 10% acetone in benzene and provided 88% recovery. The degradation products plus the original compound accounted for 85% of the radioactive tracer with about 15% not being able to be extracted from the wheat surface. A TLC method providing for the detection of 0.1 μg of Phoxim qualitatively and 1 μg quantitatively was developed using methylcyclohexane as the eluting solvent and dimethylformamide as the stationary phase on silica gel plates. The chromogenic sprays were 2,6-dibromo-*N*-chloro-*p*-quinone imine, trichloro-*p*-quinone imine, or 4-(*p*-nitrobenzyl)pyridine. (Author abstract reprinted by permission of the American Chemical Society)

76-1122. Kishk, F. M.; El-Essawi, T.; Abdel-Ghafar, S.; Abou-Donia, M. B.* (Dep. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC 27710). **Hydrolysis of methylparathion in soils.** *J. Agric. Food Chem.* 24(2): 305-307; 1976. (11 references)

The possible enzymatic hydrolysis of methyl parathion insecticide in soil has been investigated. Methyl parathion hydrolyzing activity was partially destroyed by heating and completely destroyed by autoclaving of the soil. The optimum conditions for methyl parathion hydrolyzing activity in soil have been established, and found to have an optimum pH value at pH 7. Two saturation constants (*K*m) were obtained from a Lineweaver-Burke plot which have the values. Clay minerals did not exhibit any measurable hydrolytic activity on the insecticide; however, preincubation of sterilized clays with the soil or the insecticide resulted in a reduced hydrolytic activity of the soil. Considerable evidence is presented to suggest that methyl parathion was hydrolyzed enzymatically in soil. (Author abstract reprinted by permission of the American Chemical Society)

76-1123. Singhal, J. P.; Singh, C. P. (Fac. Eng. Technol., Muslim Univ., Aligarh, India). **Studies on the adsorption and interaction of 1,2-dibromo- 3-chloropropane. I. With montmorillonites.** *J. Agric. Food Chem.* 24(2): 307-310; 1976. (20 references)

The adsorptive behavior of 1,2-dibromo-3-chloropropane on montmorillonite suspensions as affected by saturating cations yielded H class isotherms. Rapid initial adsorption pointed to chemisorption. The data agreed with the Langmuir equation. No desorption of the pesticide occurred on treatment of the complex with organic salts suggesting a strong nonionic electrostatic binding of the chemical to the clay surface. Electrical conductivity and pH observations were in accordance with the formation of an ion-dipole complex. X-ray diffraction showed a maximum interlamellar expansion of 6.42 A, confirming an upright monomolecular ion-dipole bonded adsorption of the chemical with penetration and swelling of the substrate micropores by the solute. (Author abstract reprinted by permission of the American Chemical Society)

76-1124. Calmon, J. P.; Sayag, D. R. (Lab. Chim. Org. Biol. Physiochim. Sol. Ecole Natl. Super. Agron., Toulouse Cedex, France). **Kinetics and mechanisms of conversion of methyl 1-(butylcarbamoyl)- 2-benzimidazole carbamate (benomyl) to methyl 2-benzimidazole carbamate (MBC).** *J. Agric. Food Chem.* 24(2): 311-314; 1976. (12 references)

The investigation of the effect of pH on the kinetics of hydrolysis of benomyl in acidic media, together with a search for buffer catalysis and hydrogen-deuterium isotope effect, do not preclude totally general base catalysis; however, its role is not very important and therefore the involvement of the solvent in the reaction mechanisms can be neglected. On the contrary, the study of the ionization of benomyl in acidic media, the good agreement between the p*K*a values determined both spectrophotometrically and kinetically, as well as the positive value of the entropy of activation, provide decisive arguments for a mechanism which proceeds by spontaneous intramolecular catalysis operating on the neutral form of the substrate. (Author abstract reprinted by permission of the American Chemical Society)

76-1125. Calmon, J. P.; Sayag, D. R. (Lab. Chim. Org. Biol. Physiochim. Sol. Ecole Natl. Super. Agron., Toulouse Cedex, France). **Kinetics and mechanisms of conversion of methyl 1-(butylcarbamoyl)- 2-benzimidazole carbamate (benomyl) to 3-butyl-2,4-dioxo [1,2-a]-*s*-triazino befzimidazole (STB) and 1-(2-benzimidazolyl)- 3-*n*-butylurea (BBU).** *J. Agric. Food Chem.* 24(2): 314-317; 1976. (7 references)

The investigation of the effect of pH on the kinetics of hydrolysis of benomyl in alkaline media introduced several reaction mechanisms. In mildly alkaline media (pH < 12), the study of the ionization of benomyl showed that its conversion to STB proceeds by an E1cB elimination mechanism, followed by a fast cyclization; the reaction species is the anionic form of the substrate which results from proton abstraction on the nitrogen of the methylcarbamate group. The p*Ka* values determined both spectrophotometrically and kinetically are in good agreement. In strongly alkaline media (pH > 12), benomyl is converted into STB via a dianion. The conversion of STB to BBU which occurs only in very strongly alkaline media (pH > 13.5) is first order with respect to hydroxide ion. (Author abstract reprinted by permission of the American Khemical Society)

76-1126. Kearney, P. C.; Kontson, A. (Agric. Environ. Qual. Inst., Agric. Res. Serv., U.S. Dep. Agric. Beltsville, MD 20705). **A simple system to simultaneously measure volatilitation and metabolism of pesticides from soils.** *J. Agric. Food Chem.* 24(2): 424-426; 1976. (13 references)

A new system is described which permits simultaneous measurement of pesticide loss by volatilization and metabolic CO_2 evolution from soils. A polyurethane foam plug effectively trapped volatile dinitroaniline her-

bicides arising from soil surfaces, while allowing $^{14}CO_2$ to pass through the plugs and subsequently become trapped in alkali solution. Trifluralin (α,α,α-trifluoro- 2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine) was more volatile than butralin [4-(1,1-dimethylethyl)- *N*- (1-methylpropyl)- 2,6-dinitrobenzenamine] when applied to soil surfaces. Volatilization was the major loss mechanism for trifluralin during the first 3 weeks after application. The distribution of volatile products from trifluralin was drastically altered when exposed to an ultraviolet lamp. (Author abstract reprinted by permission of the American Chemical Society)

76-1127. Jalali, I.; Anderson, J. P. E.* (Inst. Bodenbiol., Forschungsanst. Landwirtsch., Braunschweig, Germany). **Uptake of benomyl by the cultivated mushroom, *Agaricus bisporus*.** *J. Agric. Food Chem.* 24(2): 431-432; 1976. (7 references)

Fruiting bodies of *Agaricus bisporus*, grown under commercial conditions in substrates treated with 40 μg/g of benomyl at different stages of cultivation, were found to contain from 0.67 to 3.7 μg/g of benomyl residues. Mushrooms from substrates treated by drenching contained the highest quantities of residues, whereas those treated by mixing benomyl with the spawning material contained the least. Although translocation from vegetative mycelium into fruiting bodies occurred, accumulation of residues in the mushrooms was not indicated. (Author abstract reprinted by permission of the American Chemical Society)

76-1128. Farwell, S. O.; Robinson, E.; Powell, W. J.; Adams, D. F. (Washington State Univ., Pullman, WA 99163). **Survey of airborne 2,4-D in south-central Washington.** *J. Air. Pollut. Control Assoc.* 26(3): 224-230; 1976. (26 references)

Analytical and meteorological results of 1973 and 1974 monitoring studies of atmospheric 2,4-D in the Yakima Valley in the state of Washington are presented. Daily 24 hr field samples were collected with different impactor-impinger air samplers and were routinely analyzed by electron-capture gas chromatography. Gas chromatography/mass spectrometry was employed for positive identification of the 2,4-D esters and for comparative quantitative analysis. The highly volatile, *n*-butyl 2,4-D ester represented 75% of the total chlorophenoxy herbicide burden in the air samples during 1973 and 1974, even though none was legally applied to the counties adjacent to the vineyards. The predominant low-volatility 2,4-D esters in the air samples were butoxyethanol and PGBE, whereas the amounts of isooctyl were substantially less. A definite correlation was noted on at least 5 different occasions between the concentrations of airborne 2,4-D and the herbicide related damage to vineyards. No significant correlation was noted between the 2,4-D application data for eastern Washington and days with relatively high concentrations of 2,4-D or times of extensive herbicide injury to non-target crops. It is suggested that there is a major source area of 2,4-D herbicides outside the state of Washington. A weather pattern has been identified which can act as a long distance transport mechanism for airborne 2,4-D. As a result of this 2 yr study, several changes were made in the application regulations for 2,4-D herbicides in Washington. Highly volatile formulations of isobutyl and *n*-butyl 2,4-D esters have been banned. Furthermore, the application of low volatility 2,4-D esters in the counties surrounding the grape-growing regions has been restricted from May 16 to Oct. 31 of each yr.

76-1129. Walker, A. (Weeds Sect., Natl. Veg. Res. Stn., Wellesbourne, Warwick, England). **A simulation model for prediction of herbicide persistence.** *J. Environ. Qual.* 3(4): 396-401; 1974. (10 references)

A simulation model for prediction of herbicide persistence in the field is described. The model combines the effects of soil temperature and soil moisture content on the rates of herbicide loss, determined experimentally under controlled conditions, with the fluctuations in surface soil temperature and moisture content in the field. The computer program includes methods of simulating surface soil temperatures and moisture contents from standard meteorological data. In order to test the model, the degradation of napropamide (2-(α-naphthoxy)-*N*,*N*-dimethylpropionamide) was examined. Under controlled conditions, loss of activity followed first-order kinetics with half-lives of 54, 63, and 90 days at 28°C with soil moisture contents of 10.0, 7.5, and 3.5%, respectively. At 14°C, half-lives at 10.0 and 7.5% soil moisture were 102 and 112 days, respectively. When this data was used in the simulation model in conjunction with the relevant meteorological information, the patterns of loss of napropamide incorporated 2 to 3 cm in the field could be predicted. Napropamide was lost rapidly when applied to the soil surface, and since the model only takes into account losses through microbial or chemical metabolism, this could not be simulated. Some of the limitations and the potential benefit of the simulation technique for prediction of pesticide persistence are discussed. (Author abstract by permission)

76-1130. Yaron, B.; Bielorai, H.; Kliger, L. (Div. Soil Residue Chem., Inst. Soils Water, ARO, Volcani Cent., Bet Dagan, Israel). **Fate of insecticides in an irrigated field: azinphosmethyl and tetradifon cases.** *J. Environ. Qual.* 3(4): 413-417; 1974. (7 references)

The fates of an organphosphorus (azinophosmethyl) and an organochlorine insecticide (tetradifon) in an irrigated potato field on a loessial sierozem soil were studied. Two amounts of irrigation water (5538 and 4015 m^3/ha) were applied; the kinetics of persistence and the movement downward of the two pesticides were followed during the irrigation season. The azinphosmethyl was not transported deeply into the soil by the irrigation water, and it disappeared from the field 30 days after application. The

tetradifon was found in trace amounts in the deeper layer of the soil and was persistent throughout the irrigation season. The pesticides' persistence was not affected by the irrigation treatments; however, tetradifon transport into the soil was affected by the amount of water applied. Residues of tetradifon were found in the potato peel. (Author abstract by permission)

76-1131. Helling, C. S. (Agric. Res. Center-West, Beltsville, MD 20705). **Dinitroaniline herbicides in soils.** *J. Environ. Qual.* 5(1): 1-15; 1976. (85 references)

The behavior and fate of dinitroaniline herbicides in the soil environment are reviewed. This rapidly expanding class of herbicides is used particularly for preemergence control of annual grasses and small-seeded broadleaf weeds in cotton (*Gossypium hirsutum* L.), soybeans [*Glycine max* (L.) Merr.], and peanuts (*Arachis hypogaea* L.). All dinitroaniline herbicides in use are 4-alkyl (or-sulfonyl)- 2,6-dinitro- *N,N*-(mono- or disubstituted) anilines, characterized by very low water solubility and basicity. Volatilization from surface applications to moist soil is substantial for trifluralin, benefin, and profluralin, but is low for nitralin and oryzalin. In water and on dry soil, dinitroanilines exposed to sunlight degrade to photoproducts that are often polar and include dealkylated and cyclic intermediates. Such photodecomposition greatly reduces bioaccumulation of dinitroanilines by aquatic organisms. Physico-chemical behavior of dinitroanilines in soils or sediments is influenced by volatilization and by strong soil adsorption. Nitralin and oryzalin may leach slightly, but dinitroanilines are essentially immobile. Short range diffusion may be important for herbicide efficacy or loss from the soil surface. Both solution and vapor phase transport components affect trifluralin diffusion; the extent and balance of diffusion are strongly affected by soil temperature, moisture, and bulk density. Phytotoxicity apparently cannot be correlated with adsorption strength, but may be related to volatility. Physical loss from soil, unless incorporated, is by sediment runoff and by volatilization. Dinitroaniline herbicides degrade more rapidly in anaerobic than aerobic soil. Metabolites are numerous and often resemble those produced by the photolytic mechanisms of dealkylation and cyclization. A gradually increasing quantity of residue becomes associated with soil organic matter as bound residue. For normal use rates, persistence in soils ranges from about 2-3 months for oryzalin and dinitramine to 5-6 months for benefin and trifluralin. Persistence increases with decreasing soil temperature and moisture content; seasonal carryover sometimes occurs. Limited evidence suggests that dinitroanilines produce no lasting effect on soil microbial processes. (Author abstract by permission)

76-1132. Khan, M. A.; Novak, A. F.; Rao, R. M. (Dep. Food Sci., Louisiana State Univ., Baton Rouge, LA 70803). **Reduction of polychlorinated biphenyls in shrimp by physical and chemical methods.** *J. Food Sci.* 41(2): 262-267; 1976. (7 references)

Physical and chemical methods (UV irradation and sodium nitrite treatment) were developed to eliminate PCBs from shrimp. Shrimp were treated with 1% sodium nitrite solution followed by 100 ppm of Aroclor 1254 or Aroclor 1260 solution; the PCB solutions contained 54% and 60% chlorine, respectively. A parallel experiment was performed without sodium nitrite pretreatment. The samples were analyzed by gas chromatography and mass spectrometry after sun drying for 12-48 hr. Complete reduction of Aroclors 1254 and 1260 was observed after 30 and 48 hr, respectively, in the sodium nitrite-treated shrimp; degradation was delayed 6 and 12 hr, respectively, in unpretreated shrimp. The complete phenomenon of degradation was presumed to involve reductive dechlorination, polymerization and/or isomerization processes. Since sun drying is a common practice in many parts of the world, it could be used to reduce or eliminate toxic PCB and possibly other organochlorine residues from seafoods.

76-1133. Chopra, S. L.; Sethi, B. K.; Baweja, A. S. (Dep. Chem. Biochem., Punjab Agric. Univ., Ludhiana, Punjab, India). **Residues of atrazine (2-chloro-4-ethylamino -6- isopropylamino- *s*-triazine) in soils.** *J. Indian Soc. Soil. Sci.* 21(3): 319-322; 1973. (8 references)

Atrazine in benzene solution was added to two soil samples at rates of 0, 0.01, 0.01, and 1.0 ppm, and the samples were incubated at 25°C for 0-34 days. The samples were analyzed for atrazine residues by gas liquid chromatography using thermionic detection. Atrazine recovery increased with increasing applied dose and decreased with increasing incubation time. There was considerable adsorption of atrazine, especially on soil A, and the adsorption reaction was not completely reversible. The two soils were similar in most respects, but soil A had a higher organic carbon and clay content than soil B. The accumulation of atrazine on the surface of the clay and organic colloids greatly reduced its concentration in the soil. In addition to atrazine, a new peak was seen on the chromatogram; the area of this peak increased in proportion to the incubation time. This peak may have reflected the hydrolysis and microbial degradation of atrazine.

76-1134. Clark, D. R., Jr.; Martin, C. O.; Swineford, D. M. (U.S. Fish Wildlife Serv., Patuxent Wildlife Res. Cent., Laurel, MD 20811). **Organochlorine insecticide residues in the free-tailed bat (*Tadarida brasiliensis*) at Bracken Cave, Texas.** *J. Mammal.* 56(2): 429-443; 1975. (17 references)

Fifty-nine free-tailed bats (*Tadarida brasiliensis mexicana*) were collected at Bracken Cave, Texas, and their tissues were analyzed by gas chromatography-mass spectrometry for residues of organochlorine insecticides and PCBs. The brain DDE residues were higher in 12 young collected from the floor than in 15 young taken from the ceiling, but food deprivation rather than insecticide apparently caused the former group to fall. Among 18 pregnant females, the DDE and DDT residues were high-

est in the yearlings. The residue levels dropped shortly after the first lactation and thereafter increased again. The residue levels in the embryos varied with the levels in the mother and the degree of embryonic development. Residues accumulated rapidly in the nursing young; the lactating females excrete from 1.3 to 16.2 g DDT in the milk per day. Maximum individual residue loads appeared to be attained toward the end of nursing. PCB residues were found in four of the animals examined.

76-1135. Mukula, J.; Siltanen, H.; Rosenberg, C.; Idanpaan-Heikkil, J.; Lallukka, R. (Author address not given). **Fenoksiherbisidien jaamat metsamarjoissa ja sienissa. [Phenoxy herbicide residues in wild berries and mushrooms.]** *Kem. Kemi* 1(9): 455-475; 1975. (15 references) (Finnish)

Twenty lingonberry and 16 wild mushroom samples were collected in northern Karelia at seven locations which had been sprayed between July 28 and Aug. 20, 1974, with 2.5 kg phenoxy acids/hectare. The samples were collected 11-92 days after the spraying, frozen immediately, and analyzed during the winter of 1974/75. Residues of both poisons used, 2,4-D and 2,4,5-T, were found in most lingonberries, 0.1-5.2 ppm of 2,4-D and 0.7-15 ppm of 2,4,5-T. The amount of residue decreased with time. Boiling the berries did not eliminate the residue. 2,4-D was found in only one sample of the mushrooms and that amounted to only 0.2 ppm. 2,4,5-T residues were 0.15-1.8 ppm. Some of the figures are above the approved residue tolerance for phenoxy acids but still below the ADI value recommended by FAO/WHO (0.3 mg/kg/day). However, since the highest residue levels approach the upper limit of toxicologically acceptable daily intake described by FAO/WHO, and even surpass it if the most stringent criteria are used, and since residue dispersion is slow, it seems advisable to totally prohibit picking berries and mushrooms from areas sprayed with phenoxy acids during the year of spraying.

76-1136. Kostyniak, P. J.; Clarkson, T. W.; Cestero, R. V.; Freeman, R. B.; Abbasi, A. H. (Dep. Radiat. Biol. Biophys., Univ. Rochester Sch. Med. Dent., Rochester, NY). **An extracorporeal complexing hemodialysis system for the treatment of methylmercury poisoning. I. In vitro studies of the effects of four complexing agents on the distribution and dialyzability of methylmercury in human blood.** *J. Pharmacol. Exp. Ther.* 192(2): 260-269; 1975. (33 references)

A new approach for the treatment of methylmercury poisoning is presented involving the high affinity of methylmercury for sulfhydryl groups and combining this concept with hemodialysis. The hemodialysis consists of a blood compartment and a dialysate compartment separated by a semipermeable dialysis membrane. In this study, arterial blood, previously incubated with an appropriate concentration of diffusible complexing agent (RSH), is passed through the dialyzer. Redistribution of methylmercury occurs from protein-binding sites into a diffusible complex form ($RS\text{-}HgCh_3$). Diffusion of the $RS\text{-}HgCH_3$ complex, as well as the RSH, occurs according to the chemical potentials of these moieties in the blood and dialysate phases. The net result is a diminution of methyl mercury concentration in the blood as well as a depletion of the free complexing agent. The successful conversion from this in vitro procedure to an in vivo application for rapid and safe removal of methylmercury from the body will depend on several key factors. The complexing agent should act with sufficient speed so that a large redistribution of methylmercury has taken place before the arterial blood enters the dialysis membrane. The redistribution is time dependent and by means of mixing coils the in vivo dialysis system may be easily manipulated so that this criterion is met. This study showed that the magnitudes of the protein binding reversal of the sulfhydryl agents pencillamine, *N*-acetylpenicillamine, cysteine, and *N*-acetylcysteine were similar. Concentration-dependent reversals of protein binding of methylmercury in blood were noted. At increasing sulfhydryl concentrations from 0.1 10 m*M*, a 55 to 60-fold increase in non-protein-bound plasma methylmercury was noted, when compared to blood with no added sulfhydryl agent. Using a Travenol 145 twin coil hemodialyzer, both the complexing agent and the methylmercury complex formed in blood were readily dialyzable. At cysteine concentrations of 10m*M* in whole blood, up to 44% of whole blood methylmercury was dialyzed on a single pass at a dialyzer blood flow rate of 55 ml/min. Under the same conditions, up to 94% of plasma cysteine was dialyzed.

76-1137. Vorob'eva, N. M.; Lapchenko, V. S. (Kiev Sci. Res. Inst. Food Hygiene, Kiev, USSR). **Ostatki amifosa v rasteniyakh i reglamenty ego primeneniya v sel'skom khozyaystve. [Amiphos residues in plants and regulations concerning its use in agriculture.]** *Khim. Sel'sk. Khoz.* 13(11): 876-877; 1975. (7 references) (Russian)

The residue dynamics of amiphos (*O,O*-dimethyl-*S*-2-(acetamide) ethyldithiophosphate) were studied in vegetables, fruits, and sugar beets to elaborate regulations on its use in plant protection. Amiphos did not impair the organoleptic properties of apples, sugar beets, and peas after application in normal doses. Residues were found in apples, peas, and sugar beets after spraying, but no residues were detectable after 20 days. The findings indicate that in view of the maximum allowable residue level of 0.3 mg/kg, a 0.1-0.2% solution of amiphos should be used for treatment at expenditures of 1-2 kg/ha for fruit trees, 3-4 kg/ha for peas, and 4-6 kg/ha for beets. The necessary waiting time between application and harvest should be at least 20 days.

76-1138. Rajakannu, K.; Ali, K. A.; Raguraj, R.; Thirumurthi, S.; Subramaniam, T. R.; Krishnamoorthy, K. K. (Tamil Nadu Agric. Univ., Coimbatore, India). **Estimation of disulfoton residues in Bhefdi fruits by chemical and bioassay methods and dissipation of disulfoton in soil.** *Madras Agric. J.* 60(7): 534-536; 1973. (5 references)

Residues of disulfoton in bhendi fruits were examined after applying the chemical to the soil at the time of sowing. The insecticide was applied at 0.5 and 1.0 kg a.i./ha. On the 55th day of application the maximum residue level of disulfoton by bioassay techniques was 0.670 ppm, which is less than the permissible tolerance level of 0.750 ppm fixed by the FDA. Colorimetric estimation of disulfoton residues present in the soil was made four times, each at 15 day intervals after the insecticide was applied. The results indicate a reduction in residues from 0.420 to less than 0.100 ppm for the 0.5 kg/ha dosage, and from 0.530 to less than 0.100 for the 1.0 kg/ha dose. The insecticide dissipated slowly in the first 30 days and the decline was rapid thereafter.

76-1139. Debackere, M. (Fac. Diergeneesk., Rijksuniv. Ghent, Gent, Belgium). **The utilization of chemical compounds in animal nutrition.** *Meded. Fac. Landbouwwetensch. Rijksuniv. Gent* 38(4,Pt.1): 1085-1025; 1973. (60 references)

Probable contaminants of food products of animal origin are reviewed. Residues of nonintentional contaminants in animal nutrition can be classified as residues from environmental pollution and residues from pesticides. An example of the former class is PCBs, which break down slowly and are soluble in fat. They can therefore accumulate in the food chain; animal species at the end of the food chain receive contaminanted fish-meal in their feeds and run the greatest risks. Foodstuffs, particularly fish, are the principal source of PCB accumulation in humans. The fungicide HCB exemplifies the problems encountered with pesticides. This compound is very persistent, with an accumulation factor of 10-12. High HCB residue levels were found in hams imported from the Netherlands to the United States. Pollard pellets imported from the Argentine and used in pig feeds were the cause of this contamination. The HCB tolerance level for pig feeds is limited to 0.01 ppm. Residues of intentional feed additives which may appear in animal products include antibiotics, other chemotherapeutics, and compounds with hormonal activity. There must be sufficient legislation and legislative aids to guard the public against all types of contamination in food production.

76-1140. Dye, M. H.; Mossop, D. W. (Plant Dis. Div., DSIR, P.B., Auckland, New Zealand). **Streptomycin residues and natural antibacterial compounds in fruit.** *N. Z. J. Agric. Res.* 17(2): 157-164; 1974. (11 references)

Fruit-disc samples were assayed microbiologically to determine streptomycin residues on the skin and in the flesh of peach, plum, apricot, apple, and pear fruits taken from trees which had received 4-5 sprays with "Agrimycin 17" containing 100 ppm streptomycin. The sampling and assay method exployed allowed quantitative measurements to be made quickly on large numbers of samples. Streptomycin deposits on the order of 0.01 μg/0.5 cm^2 of fruit flesh were detectable. All detectable streptomycin on the sprayed fruit was confined to the skin. Streptomycin deposits were greater and their removal was slower on the hairy-skinned fruits such as peaches and "newcastle" apricots than on apples, pears, and plums. Deposits on apples and peaches decreased with time after spraying, both with and without rain or artificial washing. Washing removed some of the streptomycin, but other factorssappeared to be involved in its removal or decay on fruit surfaces. On all fruits investigated except peaches, streptomycin was not detectable 5 weeks after the final spray. On the peaches, some areas of some fruits still retained traces of streptomycin 7 weeks after the final spray, but none was detectable after 8 weeks. Natural antibacterial compounds were found in the flesh of some plum and apricot varieties.

76-1141. Love, J. L.; Steven, D. (Chem. Div., DSIR, P.B., Petone, New Zealand). **Methomyl residues on tomatoes.** *N. Z. J. Exp. Agric.* 2(2): 201-203; 1974. (3 references)

Methomyl was applied as a low volume spray at rates of 0, 0.25, and 0.50 kg a.i./ha to a crop of tomatoes in a glasshouse. In a second study, the pesticide was applied as a high-volume spray at rates of 0, 0.25, 0.50, and 1.00 kg a.i./ha to field tomatoes. Tomatoes taken 1-10 days after pesticide application were analyzed for methomyl residues by flame photometric gas chromatography; the limit of detection was 0.02 mg/kg, and a "trace" residue was a probable residue below this value. At 1 day after spraying at a rate of 0.25 kg/ha, the glasshouse tomatoes contained a trace of methomyl; thereafter, detectable residues were not found. In tomatoes treated with 0.50 kg/ha, 0.04 mg/kg methomyl was found at 1 day after treatment, trace residues were found at 3 days, and no residues were found thereafter. Similar results were obtained in the field trial. The only sample in which the residue level exceeded the New Zealand tolerance limit of 0.2 mg/kg was that taken 1 day after treatment with 1.00 kg/ha methomyl; in this case, the rate was four times the minimum concentration recommended and double the maximum rate. The findings suggest that the waiting period could safely be reduced from the 7 days in force in New Zealand at present.

76-1142. Heenan, M. P. (Chem. Div., DSIR, P.B., Petone, New Zealand). **Quinalphos (*O,O*-diethyl- *O*-(2-quinoxalyl) phosphorothioate) residues on apples, tomatoes, and cauliflower.** *N. Z. J. Exp. Agric.* 2(3): 271-275; 1974. (2 references)

Tomatoes, apples, and cauliflower were given a single application of quinalphos at several different rates and subsequently analyzed at intervals up to 2 weeks after application. Cauliflowers received quinalphos at rates of 0, 0.55, or 0.83 kg a.i./ha. Plants were analyzed on days 1, 2, 4, and 8 after application. Tomatoes received quinalphos at 0, 0.28, 0.57, or 0.85 kg a.i./ha and were harvested on days 1, 3, 5, 7, 9, and 12 for analysis. Apple trees received

quinalphos at rates of 0, 025, 0.50, or 0.75 kg a.i./ha or at 0, 1.0, 2.0, or 3.0 kg a.i./ha. Apples were harvested on days 1, 3, 5, 9, and 15 after application. Residues on the apples and cauliflowers did not exceed 1.0 ppm fresh weight and after 2 weeks were below 0.1 ppm. Residues on tomatoes at the highest rate were initially 2.5 ppm, but declined to below 0.4 ppm after 2 weeks.

76-1143. Kawanishi, A.; Asanuma, N.; Nakamura, S.; Ide, H.; Hagiwara, A.; Katsumata, C.; Yokoyama, T.; Oshiba, H.; Takayama, C. (Dep. Pestic. Intox., Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Studies on organochlorine pesticide residues in human body. Part 3.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 90-98; 1974. (5 references) (Japanese)

Monitoring of organochlorine pesticide residues was begun in 1970 to study their presence in the human body and their effects on health since the ban on their use. The 1973 results are presented. Values determined were *p,p'*-DDE (4.415 ppm, highest accumulation in human fat); β-BHC (2.517 ppm); *p,p'*-DDT (1.357 ppm); dieldrin (0.129 ppm); *p,p'*-DDD, (TDE) (0.097 ppm); and, in decreasing order, α-BHC, *o,p'*-DDT, γ- and δ-BHC. There was a tendency towards more total BHC and total DDT accumulation in men, while dieldrin, on the other hand, was higher in women. Accumulation seemed to be higher, though not significantly, in older persons. According to the data on pesticide accumulation in organs, their distribution (content in the liver was calculated as unity) is: total BHC (0.67 ppm), total DDT (0.29 ppm), and dieldrin (0.21 ppm) in the kidney; total BHC (25.1 ppm), total DDT (23.1 ppm), and dieldrin (5.7 ppm) in subcutaneous fat; and total BHC (20.3 ppm), total DDT (18.8 ppm), and dieldrin (4.3 ppm) in the mesentery. In a survey of the relationship between organochlorine content of body fat and diseases, the content in cancer patients showed a slightly higher value than that in other patients.

76-1144. Igarashi, H.; Uchiyama, M.; Sato, R. (Fac. Agric., Tokyo Univ. Agric. Technol., Tokyo, Japan). [**Fate of pentachloronitrobenzene (PCNB) in soils.**] *Noyaku Kagaku (J. Pestic. Sci.)* 3(3): 132-136; 1976. (15 references) (Japanese)

^{14}C-labeled pentachloronitrobenzene was synthesized and its fate monitored in four soil types (farm soil of volcanic ashy loam, mineral loam, paddy field soil of volcanic minute sandy loam, and paddy field soil of alluvial clay loam). Evolution of labeled carbon dioxide was very small and about 20-50% PCNB applied to soils was confirmed as bonded with soil components. Of the soil-bonded elements, pentachloroaniline was confirmed as a compound extractable with methanolic alkali. Of the metabolic degradates soluble in organic solvent (acetone and mixture of acetone and *n*-hexane), pentachloroaniline and pentachloroanisole were identified, as well as an unknown compound. The major metabolite was pentachloroaniline.

76-1145. Sidhu, J. S.; Muthu, M.; Bains, G. S. (Central Food Toxicol. Res. Inst., Mysore, India). **A study of 1,2-dibromoethane residues in wheat and milled products.** *Pestic. Sci.* 6(5): 451-455; 1975. (9 references)

A method is described for determining residues of 1,2-dibromoethane (EDB) in milled wheat products. The residues are first extracted with benzene, then recovered azeotropically for reaction with alkali and subsequent determination of liberated bromide ion by a Volhard titration. Freshly milled flours from wheat fumigated with 65.0 and 325 mg EDB/l at 37°C were found to contain 10.6 to 39.4 mg EDB/kg and the bran contained from 51.4 to 153 mg EDB/kg. (Author abstract by permission)

76-1146. El Zorgani, G. A. (Agric. Res. Corporation, Wad Medani, Sudan). **Residues of DDT in cottonseed after spraying with DDT and Torbidan.** *Pestic. Sci.* 6(5): 457-460; 1975. (6 references)

DDT at 1.12 and 2.24 kg/ha a.i. and Torbidan at 5 and 10 liter formulation/ha (camphechlor, DDT, and methyl parathion) (1 and 2 kg DDT/ha) were sprayed five times on cotton over a period of 15 weeks. Seeds from the first pick of the crop were found to contain as residues *p,p'*-DDT and *p,p'*-DDE [1,1-dichloro- 2,2-di- (4-chlorophenyl) ethylene]. The highest residue level (0.783 ppm) was found in seeds from Torbidan 10 l/ha treatment. (Author abstract by permission)

76-1147. Businelli, M.; Tafuri, F.; Scarponi, L.; Marucchini, C. (Ist. Chim. Agrar., Univ. Perugia, Perugia, Italy). **Persistence of benfluralin in soil and its uptake by carrots.** *Pestic. Sci.* 6(5): 475-480; 1975. (8 references)

Analytical methods are described for the determination of residues of benfluralin in soil and carrots. All plots treated with 1.3 or 1.9 kg benfluralin/ha produced average carrot yields significantly higher than untreated plots. Degradation of benfluralin in soil was very slow during the winter. As the temperature rose, the rate of benfluralin decline was accelerated; 324 days after incorporation, benfluralin residues were reduced to about 11 and 14% of the applied dose. The average total residues of benfluralin found in whole carrots were 210 ± 18 and 240 ± 47 ng/g following doses of 1.3 and 1.9 kg a.i./ha respectively. The peel of carrots contained 92% of the total residue, and there seemed to be little translocation of the compound through the plant tissues. (Author abstract by permission)

76-1148. Williams, J. H. (Agric. Develop. Advisory Serv., Woodthorne, Wolverhampton, England). **Persistence of chlorfenvinphos in soils.** *Pestic. Sci.* 6(5): 501-509; 1975. (5 references)

The persistence and behavior of chlorfenvinphos, an organophosphorus insecticide, was studied on different soils. On a peaty soil the insecticide was only very slowly degraded; 70% of the applied dose remained after 21 weeks

and 30% after nearly 12 months. On the sandy soils, however, persistence was much shorter; between 3 and 15% of the applied dose remained after a period of 15 weeks. Rates of loss appear to be related to soil moisture conditions; in dry seasons, although the initial rate of loss was high, subsequent rate of breakdown was slower than in wetter seasons. The results are discussed relative to the efficiency of the insecticide for controlling brassica root fly. (Author abstract by permission)

76-1149. Buchenauer, H. (Lehrstuhl Phytopathol. Pflanzenschutz, Univ. Hohenheim, Stuttgart, Germany). **Differences in light stability of some carboxylic acid anilide fungicides in relation to their applicability for seed and foliar treatment.** *Pestic. Sci.* 6(5): 525-535; 1975. (27 references)

Irradiation of carboxin, fucarbanil, pyracarbolid, cyclafuramid, benodanil, mebenil and oxycarboxin by UV light (254 nm) for 4 hr resulted in 97, 64, 58, 50, 20, 18, and 15% inactivation, respectively. Photoinactivation of the different compounds in aqueous solution or in the solid state was much slower in sunlight than in UV light and stability increased in the following order: carboxin < furcarbanil ≤ cyclafuramid ≤ pyracarbolid < mebenil ≤ benodanil < oxycarboxin. The residues of carboxin and furcarbanil on the leaf surface of bean plants were almost completely inactivated after 40 hr exposure to sunlight; cyclafuramid lost 85% of its activity. The toxicity of leaf deposits of pyracarbolid, mebenil, benodanil, and oxycarboxin decreasedsby 83, 53, 50, and 41%, respectively after 80 hr in sunlight. The compounds with low photostability (e.g., carboxin, furcarbanil, and cyclafuramid) are recommended mainly for controlling seed- and soil-borne fungi; pyracarbolid, mebenil, oxycarboxin, and benodanil, which proved to be more photostable, appear to be useful fungicides for controlling rust diseases. Among several photochemical decomposition products of carboxin detected, the sulfoxide and sulfone were identified. (Author abstract by permission)

76-1150. Zeana, R. C.; Zeana, A. (Author address not given). **Cercetari privind comportarea lindanului in procesul de epurare biologica cu namol activ. [Studies in the behavior of lindane during biological water treatment with activated sludge.]** *Rev. Chim. (Bucharest)* 25(11): 901-905; 1974. (8 references) (Romanian)

While lindane is highly toxic to higher organisms, it has little effect on the microorganisms contained in activated sludge, at least in quantities up to the amount soluble in water. It is thus possible to remove considerable lindane daily from a biological treatment plant along with the excess sludge, after which it can be concentrated, filtered, and incinerated. Additional amounts are decomposed by the sludge flora. Verification of the relative harmlessness of lindane to the flora was made in connection with an oxo process alcohol plant. The amount of lindane removed by this method was estimated to be 2.85 mg per gram of volatile substances, or 0.65 mg per gram of sludge removed (expressed as BOD-5).

76-1151. Bolay, A.; Gnaegl, F.; Semoroz, J. L. (Stn. Fed. Rech. Agron., Lausanne, Switzerland). **Traitements tardifs et residus de fongicides sur pommes. [Late treatments and fungicidal residues on apples.]** *Rev. Suisse Vitic. Arboricult. Hort.* 6(1): 13-15; 1974. (3 references) (French)

The effects of late treatment with high fungicide doses and of different storage conditions were studied on the fungicide residues in apples. The apple trees were sprayed with folpet, captan, dichlofluanid, mancozeb, or benomyl on August 29 and on September 16 and 29 before harvesting on October 5. On Oct. 5, the residue levels in apples were 1.72 ppm for folpet, 1.03 for captan, 1.26 ppm for dichlofluanid, 0.68 ppm for mancozeb, and 0.44 ppm for benomyl, i.e., consistently below the maximum allowable levels, except for dichlofluanid. The folpet, captan, and dichlofluanid residues decreased by about 50% in 3 months after storage under customary conditions at 1.5°C and at 92% humidity, while benomyl and mancozeb showed practically no degradation. The rate of degradation was insignificant for all fungicides when the apples were stored in closed spaces with controlled atmosphere (2°C, 92% humidity).

76-1152. Thorstenson, J. H.; Dorough, H. W. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Chlorinated insecticide residues in the University of Kentucky reference and alkaloid series cigarettes.** *Tob. Sci.* 20(5): 25-28; 1976. (22 references)

Electron capture gas chromatography was used to determine the chlorinated hydrocarbon insecticide residue levels in the research and reference cigarettes produced by the University of Kentucky's Tobacco and Health Research Institute. Total chlorinated insecticide residues on the cigarettes manufactured in 1969 ranged from 12.5 to 64.3 ppm, the highest levels appearing in the 1R1 reference cigarette. DDT-TDE residues accounted for more than 97% of the total residues in these cigarettes; the remainder consisted of dieldrin and endrin residues. No endosulfan was detected. For the cigarettes manufactured in 1974, the chlorinated insecticide residues ranged from 3.6 to 7.1 ppm. DDT-TDE accounted for 62-77% of the total and endosulfan accounted for the remainder. Smoke condensate derived from the 1969 1R1 cigarette under standard smoking conditions contained an average of 8.3 μg DDT-TDE residues/cigarette. Approximately 9.2% of the *p,p'*-DDT was transferred intact to the mainstream smoke.

76-1153. Kelso, J. R. M.; Frank, R. (Ontario Ministry Natural Resources, Nanticoke Project, Port Denver, Ontario, Canada). **Organochlorine residues, mercury, copper and cadmium in yellow perch, white bass and smallmouth bass, Long Point Bay, Lake Erie.** *Trans. Am. Fish. Soc.* 103(3): 577-581; 1974. (16 references)

Yellow perch (*Perca flavescens*), white bass (*Morone chrysops*), and smallmouth bass (*Micropterus dolomieui*) were caught in Lake Erie's Point Bay in

May, July, and late October. The fish were analyzed for residues of DDT, PCB, mercury, copper, and cadmium. The fat content of the fish varied seasonally among all species: the lowest values were observed in the spring and the highest values in the fall. The total DDT residues were low for all species; the means ranged from 0.09 to 0.27 μg/g and exhibited no seasonal variations. No species differences were observed for DDT despite differing fat contents, but the concentrations within a species increased with fat content and age. The PCB levels ranged up to 6.5-fold higher than the DDT levels. The PCB residues, which were lowest in the yellow perch and highest in the white bass, did not vary seasonally but did increase with increasing fat content. The dieldrin concentrations were low and did not vary with fat content or season. Only two fish contained mercury residues in excess of 0.5 μg/g; mercury content is apparently related to size and age. The copper and cadmium values were low in all species.

76-1154. Coppage, D. L.; Braidech, T. E. (Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561). **River pollution by anticholinesterase agents.** *Water Res.* 10(1): 19-24; 1976. (31 references)

Fish AChE is used to investigate possible anti-AChE poisoning resulting from the discharge of effluent into a river system by a manufacturer of organophosphate and carbamate pesticides. Fish were caught upstream and downstream and the brain-AChE activity measured in each. Fish upstream had significantly greater (205%) brain-AChE activity than carp caught downstream. The AChE activity patterns in carp-suckers, *Carpiodes sp.*, at the upstream and downstream stations were similar to carp at the same stations. Gizzard shad, *Dorosoma cepedianum*, from upstream stations did not have significantly greater brain-AChE activity than gizzard shad from downstream locations. Gizzard shad are the least useful of the 3 species tested as indicators of point-source pollution by anti-AChE agents as they are more migratory and may move into and out of polluted areas rapidly. Other fish were exposed to diluted effluent in glass jars and their brain-AChE measured to determine combined poisoning potential of compounds present. Fish exposed to the diluted effluent had lower brain-AChE activity than unexposed fish. Substantial amounts of AChE-inhibiting pesticides were present in the effluent relative to their toxicities. The data from this study indicates that the effluent is a contributing factor in the reduced brain-AChE activity of Missouri River fishes. The data also demonstrates that brain-AChE measurement in fishes is a sensitive and reliable indicator of such pollution.

76-1155. Fountaine, J. E.; Joshipura, P. B.; Keliher, P. N. (Chem. Dep., Villanova Univ., Villanova, PA 19085). **Some observations regarding pentachlorophenol levels in Haverford Township, Pennsylvania.** *Water Res.* 10(3): 185-188; 1976. (9 references)

PCP residues were determined in Naylor's Run Creek in Haverford Township, Pennsylvania. Origins and possible solutions of the pollution problem are discussed. A specially designed UV ratio spectrophotometer was used for the analytical determinations. The concentrations of PCP found in the samples ranged from 0.1 to 10 ppm. Near the source of the stream the levels were highest; they were much lower downstream. As PCP does not decompose to any significant extent in its flow of several miles, it must be either absorbed, or diluted, or both. In studying the concentration of PCP at different levels in the water, a collected sample was allowed to stand for 2 days. Measurements on this standing sample indicated that PCP concentration levels were highest next to the surface. It is suggested that PCP is slowly being extracted from the oil slick usually present on the surface of the contaminated water and gradually enters the aqueous phase. While these results can not be directly extrapolated to the flowing stream, it is felt that some of the PCP arriving downstream was carried by the oil slick layer and that PCP from this layer was slowly diffusing into the stream water. The flow rate at the discharge point was estimated to be 720 l/hr. From the PCP concentrations, the volume of samples, and the flow rate of the water discharged, it was possible to estimate the PCP discharge per unit time. Two different samples were studied; 13.4 and 13.3 g/hr of PCP were discharged. Simply stopping the discharge from the factory outlet into the stream will not alleviate this problem. The factory has been in business for over 20 yr, and gross spillage of PCP has occurred in the area, allowing PCP to seep into the ground. Thus, some of the PCP discharge may not be a direct result of present factory processing, but may result from saturation of the factory area with excess PCP. Skimming off the oil slick layer may be moderately successful as much of the PCP is concentrated in this layer. A coagulation system would lower oil and thus PCP levels. A macroreticular resin bed might also be used. Finally, it is suggested that PCP decomposing bacteria be used to significantly lower PCP concentrations in the stream.

76-1156. Weber, K. (Inst. Meeresforsch., D-2850 Bremerhaven-G., Germany). **Degradation of parathion in seawater.** *Water Res.* 10(3): 237-241; 1976. (9 references)

Parathion degradation was studied in seawater with emphasis on determining which environmental conditions influence its decomposition. A laboratory solution of parathion and water was made to a concentration of about 10 ppm for the insecticide. After one year of decomposition time at room temperature, about 20% of the initial amount of parathion had not yet been degraded, thus showing a surprisingly high persistence. The studies showed that there are two main routes active in the degradation of parathion in sea water: chemical hydrolysis and biological decomposition. Two pathways were found in chemical hydrolysis. The first reaction proceeds via dearylation with loss of *p*-nitrophenol. The second main path involves hydrolysis through dealkylation leading to a sec-

ondary ester of phosphoric acid which still contains the *p*-nitrophenol moiety, deethylparathion. Hydrolytic stability of the secondary ester, existing as an anion in seawater, far exceeds that of the neutral parathion. The chemical hydrolysis of parathion was strongly dependent on reaction temperature. It is predicted that during winter months with average water temperature of less than 5°C, not even 5% of the parathion will be destroyed by chemical hydrolysis in an estuarine water body. Free naturally occurring enzymes apparently do not influence hydrolysis to any considerable degree. In determining the effect of acidity, it was noted that even at pH 1, a slowdown of the reaction of only 10% was noted. However, a doubling of the hydrolysis rate took place comparing the reaction in salt-free water of pH 5.9 to the reaction in water of pH 8.6. Hydrolysis to *p*-nitrophenol is favored through high hydrogen and hydroxyl ion activity, whereas the second hydrolytic pathway is mainly observed in neutral media. Degradation rate nearly doubled in neutral salt solutions compared to distilled water. This increased rate was attributed to the higher ionic strength which influences hydrolysis through primary and/or secondary salt effects. It was noted that hydrolysis to *p*-nitrophenol was less pronounced in saltwater compared to salt-free water of about the same pH. The degradation of parathion appeared strongly influenced by the development and action of microflora.

76-1157. Robinson, E. L. (Field Crops Utilization and Marketing Res. Lab., Agric. Res. Serv., Dep. Agric., Athens, GA 30604). **Arsenic in soil with five annual applications of MSMA.** *Weed Sci.* 23(5): 341-343; 1975. (11 references)

Arsenic residues in soil were examined annually over a 5-yr period following annual applications of MSMA (monosodium methanearsonate) at 4.4, 9, 13, 18, 22, 36, 72, 144, and 288 kg/ha. Elemental arsenic did not increase in any plot receiving MSMA rates less than 36 kg/ha. Plots receiving 72, 144, and 288 kg/ha of MSMA for 5 yr showed significant increases in arsenic residues. The arsenic residues for the two heaviest treatments (144 and 288 kg/ha) increased significantly during the first 4 yr, but did not increase in the fifth year. (Author abstract by permission)

76-1158. Best, J. A.; Webber, J. B.; Monaco, T. J. (Velsicol Chem. Corp., Chicago, IL). **Influence of soil pH on *s*-triazine availability to plants.** *Weed Sci.* 23(5): 378-382; 1975. (19 references)

Field studies indicated that liming an acid Bladen silt loam from pH 5.5 to 7.5 increased the phytotoxicity of atrazine [2-chloro- 4-(ethylamino)- 6-(isopropylamino)-*s*-triazine] and prometryn [2,4-bis-(isopropylamino)-6-methyoxy-*s*-triazine]. Liming greatly increased the persistence of atrazine, but did not affect prometryn dissipation. Liming increased the ^{14}C-concentration present in the shoots of corn (*Zea Mays* L. 'Pioneer 3369A'), cotton (*Gossypium hirsutum* L. 'Coker 201'), and soybeans [*Glycine Max* (L.) Merr. 'Ransom'] from soil treated with ^{14}C-ring labeled atrazine, prometryn, and hydroxyatrazine [2-hydroxy- 4-(ethylamino)- 6-(isopropylamino)- *s*-triazine] in greenhouse studies. Decreases in ^{14}C-uptake by the crops were associated with adsorption and degradation of the compounds in the soil. Atrazine was taken up in much greater amounts than hydroxyatrazine. Cotton absorbed less of the *s*-triazines than soybeans or corn from soil. (Author abstract by permission)

76-1159. Colbert, F. O.; Volk, V. V.; Appleby, A. P. (Eli Lilly Co. Res. Stn., Fresno, CA 93706). **Sorption of atrazine, terbutyn, and GS-14254 on natural and lime-amended soils.** *Weed Sci.* 23(5): 390-394; 1975. (16 references)

Adsorption of atrazine [2-chloro- 4-(ethylamino) -6- (isopropylamino)- *s*-triazine], terbutryn [2-(*tert*-butylamino) -4- (ethylamino)- 6-(methylthio)- *s*-triazine], and GS-14254 [2-(*sec*-butylamino)- 4-(ethylamino)-6-methoxy- *s*-triazine] decreased on natural and limed soils as the soil pH increased to pH 8. More reduction in adsorption occurred with GS-14254 than with the other two herbicides. Increased toxicity to barley from GS-14254 was proportional to decreased adsorption by soils. Adsorption-desorption studies with Chehalis sandy loam (Cumulic Ultic Haploxeroll) indicated that extent and strength of adsorption were equivalent for GS-14254 (pKa 4.36) and terbutryn (pKa 4.32) at a soil pH of 5.20. Two soils, Boyce silt loam (pH 9.6, Cumulic Haplaquoll) and Crooked silt loam (pH 8.5, Xerolic Durorthid), adsorbed the *s*-triazines readily in contrast to the soils below pH 8. The high adsorption values were substantially by the GR50 values on barley for atrazine and terbutryn, 10.2 and 13.2 kg ai/ha, respectively. (Author abstract by permission)

76-1160. Grover, R. (Res. Stn., Aric. Canada, Regina, Saskatchewan, Canada). **Relative volatilities of ester and amine forms of 2,4-D.** *Weed Sci.* 24(1): 26-28; 1976. (8 references)

The relative volatilities of various technical and formulated ester and amine salts of 2,4-D [(2,4-dichlorophenoxy) acetic acid] were determined in a closed air-flow system consisting of a volatilization chamber and an ethylene glycol trap. The system was operated at a flow of 28.8 l/hr and a temperature of 30°C. Trapped herbicide vapor was analyzed by gas chromatography. The relative volatilities of technical grade *iso*-propyl, butyl, propylene glycol butyl ether, and *iso*-octyl esters, were 56, 25 to 38, 4, and 1, respectively. The relative volatilities of various formulated esters and amines were of the magnitude of 440:33:1 for the high volatile, low volatile, and amine salts, respectively. (Author abstract by permission)

76-1161. Comes, R. D.; Bruns, V. F.; Kelley, A. D. (Irrigated Agric. Res. and Ext. Center, Agric. Res. Serv.,

Prosser, WA 99350). **Residues and persistence of glyphosate in irrigation water.** *Weed Sci.* 24(1): 47-50; 1976. (5 references)

Neither glyphosate [*N*-(phosphonomethyl) glycine] nor the soil metabolite aminomethylphosphonic acid were detected in the first flow of water through two canals following application of glyphosate at 5.6 kg/ha to ditchbanks when the canals were dry. Soil samples collected the day before canals were filled (about 23 weeks after treatment) contained about 0.35 ppm glyphosate and 0.78 ppm aminomethylphosphonic acid in the 0 to 10-cm layer. When glyphosate was metered into the water at a rate calculated to provide 150 ppb in the canal water at a single site on two flowing canals, about 70% of the glyphosate was accounted for 1.6 km downstream from the application site. Thereafter, the rate of disappearance diminished, and about 58% of the applied glyphosate was present at the end of the canals 8 or 14.4 km downstream from the introduction sites. (Author abstract by permission)

76-1162. Berkheiser, V. E.; Ahlrichs, J. L. (Dep. Agron., Purdue Univ., West Lafayette, IN 47907). **UV and IR spectral characteristics of chloramben in selected environments.** *Weed Sci.* 24(1): 107-114; 1976. (21 references)

Ultraviolet (UV) absorption spectra were recorded of chloramben (3-amino- 2,5-dichlorobenzoic acid) and selected relatives in solutions of different pHs. From these spectra, the Broensted acid-base properties of chloramben were deduced. Interpretations of solution spectra were applied to UV absorption spectra of chloramben adsorbed onto Ca-montmorillonite at low water content. Infrared (IR) transmittance spectra were recorded of chloramben and selected derivatives in KBr pellets and band assignments were made. Interpretations of these spectra were also applied to IR spectra of chloramben adsorbed onto Ca-montmorillonite at low water content. Both UV and IR measurements indicated that protonation of the amino group occurs and that the carboxyl group of chloramben is strongly hydrogen-bonded to the hydration water of the interlayer cations. (Author abstract by permission)

76-1163. Fairshter, R. D.; Wilson, A. F. (Dep. Med., Univ. California, Irvine, CA). **Paraquat poisoning. Manifestations and therapy.** *Am. J. Med.* 59(6): 751-753; 1975. (35 references)

This paper reviews the clinical manifestations, mechanism, and therapeutic approach to paraquat poisoning. Death is usually due to progressive respiratory failure. The prognosis is very poor once pulmonary manifestations appear. The mechanism of paraquat toxicity seems related to production of superoxide ions. Paraquat stimulates the oxidation of NADPH in cellular and subcellular fractions of rat liver and rat and rabbit lung, suggesting that paraquat may act as an electron acceptor. Reduced paraquat radicals are easily reoxidized to molecular paraquat by oxygen, with concomitant reduction of molecular oxygen to superoxide ions. Therapy depends on prevention of paraquat absorption, rapid excretion of absorbed paraquat, and modification of the tissue effects of absorbed, nonexcreted paraquat. Gastric lavage, administration of cathartics, and administration of bentonite or Fuller's earth (300 g as a 30% solution) should be performed as soon as possible after ingestion. The administration of Fuller's earth or bentonite should be repeated at regular intervals every 3 to 4 hr up to 48 hr after ingestion. Elimination of absorbed paraquat should be accelerated by forced diuresis with saline solution and mannitol. If oliguric renal failure is present, hemodialysis is probably mandatory. Paraquat toxicity is greatly enhanced by oxygen; rats given paraquat survive longer when they are treated with superoxide dismutase, especially when placed in room air rather than in oxygen-enriched environments. Some encouraging reports have been made of treating paraquat poisoning with corticosteroids or immunosuppressive agents. However, no clear cut benefit from these agents has been established.

76-1164. Goulding, R.; Volans, G. N.; Crome, P.; Widdop, B. (Natl. Poisons Inform. Serv., New Cross Hosp., Poisons Unit, London, SE 14, England). **Paraquat poisoning.** *Br. Med. J.* 1(6000): 42; 1976. (3 references)

A relatively simple urine test can reveal whether a significant quantity of paraquat is being excreted and accordingly whether a toxic amount has been absorbed. This test relies on the reduction of paraquat to a blue free radical by alkaline sodium dithionite. The reagent must be freshly prepared by adding 10 ml of 1 *M* sodium hydroxide to 100 mg pure sodium dithionite. The test is sensitive to 1.0 mg/l in clear urine. Since diquat is reduced to a green free radical, a green to blue coloration indicates Weedol ingestion. A change to some shade of green or blue, while not offering proof positive of paraquat ingestion, points towards an unfavorable prognosis. On such patients it is recommended that treatment be started at once. Immediate treatment involves prompt but careful gastric aspiration and lavage, after which 500 ml of a 30% suspension of fuller's earth together with 5% magnesium sulfate is left in the stomach. The effectiveness of charcoal hemoperfusion is being studied.

76-1165. Hamza, S. M. (Fac. Vet. Med., Ein Shams Univ., Zagazing, Egypt). **Relationship between depression of blood cholinesterase and paralysis in Egyptian buffaloes by an organic phosphorus compound.** *Egypt. J. Vet. Sci.* 10(1-2): 53-63; 1973. (40 references)

An incurable neurotoxic syndrome with hind quarter paralysis was investigated in about 1500 buffaloes and 50 cows in Kotour Center, Tanta, in Gharbia Province. The disease was characterized by clinical signs of organophosphate intoxication. Death of the animals occurred from one to several weeks post-paralysis. The time to onset of clinical manifestations was 40-50 days after first exposure. Exposure arose from repeated aviochemical application of phosvel (leptophos) dust over the cotton crops in some villages of Kuotour Center, Tanta. The gross postmortem findings in the dead animals were indicative of mechanical trauma due to the abnormal peristaltic movements. Blood was dark brown in color. Secretions in the bronchi and trachea were abundant, due to pulmonary edema. Hemorrhagic patches were noted on the serosa of the rumen. Subserosal multiple petechiae and ecchymoses were found on the intestines. The rumen was greately distended with dry contents. The lumen of the intestines was usually devoid of ingesta and feces, and hemorrhagic enteritis was common. The liver was congested and the gall bladder was greatly distended with watery bile. Kidneys were congested, with inflammation of the mucosa of the ureters and the distended bladder. Many of the internal organs showed multiple hemorrhages. The central nervous system and meninges were congested. The blood cholinesterase activity of a large number of Egyptian buffaloes was determined, with the normal individual values at 1.86 units/ml blood. Cholinesterase levels in paralyzed buffaloes were very low. The cholinesterase levels, symptoms, and post-mortem lesions in the paralyzed animals confirmed the diagnosis of an orgaophosphate intoxication.

76-1166. Duffy, F. H.; Burchfiel, J. L. (Boston, MA). **Persistent EEG changes in primates and humans following organophosphate (Sarin) exposure.** *Electroencephalogr. Clin. Neurophysiol.* 38(1): 107; 1975.

A group of 79 industrial workers had a history of exposure to sarin. EEGs from these workers were compared with recordings from a matched control group of 38 persons. Spectral analysis was performed on the EEGs from several leads and in several states. Comparisons were made by *t*-test, Mann-Whitney U test, and chi-square analysis. Significant changes in many frequency bands were noted in the exposed group. Beta and delta waves were increased in the frontal region, fast theta was increased posteriorly, and alpha was reduced in the frontal and temporal regions. It is noted that all of the exposed workers were free of Sarin exposure for at least one year before the study was made. Therefore, the possibility of long term changes from organophosphate exposure must be seriously considered. A similar study conducted using Rhesus monkeys gave analogous results.

76-1167. Terziev, G.; Dimitrova, N.; Rusev, P. (Electronics Factory, Inst. Instrumentation, Sofia, Bulgaria). **Forensic medical and forensic chemical study of acute lethal poisonings with thiodan.** *Folia Med. (Plovdiv)* 16(5-6): 325-329; 1974. (13 references)

Five deaths occurred following intentional (two cases) or accidental poisoning with the insecticide thiodan (endosulfan). The suicides died within a short time of ingesting up to 100 ml of the poison, and two of the accident victims died 1-1.5 hr after ingesting one or two sips. A third victim immediately spat out the poison and washed out his mouth; he recovered after emergency hospital treatment. The third lethal accident victim was a 70-yr-old woman who died about 3 hr after taking "drops" for stomach pains. The clinical picture in all cases involved gagging, vomiting, diarrhea, agitation, tonic-clonic spasms of the trunk and limbs, apnea, loss of consciousness, cyanosis, dyspnea, foaming at the mouth, and noisy breathing. Autopsies of all victims showed dyscirculatory manifestations, protein dystrophy in the parenchymal organs, acute lung emphysema, and severe changes in the neurons. Thiodan (twice the LD50) was introduced by needle into the stomachs of male rats. The signs of poisoning were the same as in the human victims and death occurred due to prostration within 22-66 min. Gas chromatography of organ samples from the rats showed two thiodan peaks with high concentrations in the stomach and lower concentrations in the small intestine, liver, and kidney.

76-1168. Heyndrickx, A.; Van Hoof, F.; De Wolf, L.; Van Peteghem, C. (Dep. Toxicol., State Univ. Ghent, Ghent, Belgium). **Fatal diazinon poisoning in man.** *J. Forensic Sci. Soc.* 14(2): 131-133; 1974. (9 references)

A 65-yr-old woman who had tried to commit suicide by cutting both radial veins died after hospitalization of unknown causes. The stomach contained an oily, green fluid suggestive of an organophosphorus insecticide, and both lungs were edematous. Thin-layer chromatographic examination of the stomach and small intestinal contents revealed the presence of diazinon. Gas chromatography with flame ionization and thermionic phosphorus detection was used to quantitate the diazinon residues in the stomach and small intestine contents and various tissues. Levels of 756 mg% (stomach contents), 262 mg% (small intestine contents), 30 μg% (brain), 8 μg% (liver), 4 μg% (kidney), and 1.5 μg% (lung) were revealed. No peaks assignable to diazoxon were observed.

76-1169. Fukuhara, T. (Fac. Agric., Tokyo Univ. Agric. Technol., Tokyo, Japan). [**On the safety of insect viruses as insecticides.**] *Kagaku To Seibutsu (Chem. Biol.)* 13(12): 808-813; 1975. (22 references) (Japanese)

Microbial insecticides are one product category which the Japanese Science and Technology Agency has adopted as the object of technical development. To date, cytoplasmic polyhedral disease virus has been registered as an insecticide against *Dendrolimus spectabilis* in Japan. These types of insect pathogens have long existed in nature and their safety to humans, animals, and fish has been supported by a long history of experience. However, in the future, when they are artificially applied in fields, their safety should be very carefully examined. Other species of insecticidal viruses are under study and the criteria have been established for registration of these types in the United States. Not only must they pass the usual toxicological tests, but they must not proliferate or persist in vetebrate cells, invade cultured vetebrate cells, or form viral DNA, matured granules, or polyhedrons without a mutual reaction between the cells and the virus.

76-1170. Binnie, G. A. C. (Buchan Lodge, Norham, Berwick-on-Tweed, England). **Paraquat.** *Lancet* 1(7899): 169-170; 1975.

Within the last 10 mo, the poisons center in a single district in England has dealt with 12 cases of paraquat poisoning; there was only one survivor. Although paraquat has commercial uses as a weed-killer, it is not indispensable. Because it is so highly toxic, would-be suicides and homicides have little opportunity for a change of mind and recovery if paraquat is taken in amounts greater than 5 ml. There is no evidence to date to indicate that paraquat is anything less than lethal, and its manufacture, storage, and use should be banned.

76-1171. Fletcher, K. (Imperial Chem. Ind., Ltd., Alderley Park, Cheshire, England). **Paraquat.** *Lancet* 1(7901): 278; 1975. (2 references)

In the United Kingdom in 1974 there were 34 deaths due to paraquat: 21 suicides, 7 of unknown circumstances, and 2 homicides. The deaths were not concentrated in any particular area. Of 97 cases of paraquat poisoning recorded in the medical literature, 29 recovered. The ethical justification for the continued use of paraquat must lie in its great value in helping food production. Due to its unique properties, it is at present irreplaceable in most applications. In well over 100 countries, the agricultural community considers the pesticide indispensable.

76-1172. Newman, J. F. (Author address not given) **The effects of pesticides on soil animals.** *Nat. Soc. Clean Air. Annu. Conf. Proc.* 40(Pt.1) Report No. 7, 6pp. 1973. (7 references)

Much work must be done today before a new pesticide can be introduced into agricultural use, to determine whether the proposed use will lead to undesirable environmental effects in the soil or elsewhere. Even in direct applications of insecticides to the soil it is not possible to achieve an even distribution of the chemical through the surface layers of the soil. Some insecticides, such as the organochlorines, persist for a long time in the soil. Ten to 20 yr may be required for 95% of an applied dose of DDT to disappear from the soil. The prolonged interference with

the decomposer functions of the soil results in changes in soil structure, with undecomposed vegetation accumulating on the soil surface and adverse changes in soil fertility which persist for several years. Indirect effects of organochlorine insecticides may be even greater and more significant than direct effects. These indirect effects include feeding by birds on worms which have been contaminated by insecticide and the thinning of eggshells due to indirect exposure. Very sensitive methods have been developed for detecting the presence of organochlorine residues. Toxicologic studies performed on people occupationally exposed to DDT have indicated that each day these workers take in as much as 1000 times the amount to which the general public is exposed, suggesting that the safety factor is quite large. Organochlorine insecticides are being largely replaced by the organophosphorus and carbamate insecticides which are generally much less chemically stable and are relatively rapidly broken down. Some toxicological hazards exist in the use of mercury fungicides as seed dressings, but these are related either to the handling of the seed dressings or to the accidental or careless improper use of treated seed for animal or human food. Herbicides in general have a low toxicity to animal life and direct effects on soil fauna are not expected.

76-1173. Landreth, R. E.; Rogers, C. J. (Natl. Environ. Res. Cent., Office Res. Dev., US EPA, Cincinnati, OH 45268). **Promising technologies for treatment of hazardous wastes.** *Natl. Tech. Inform. Serv., PB* 238 145, 1974, 45 p. (47 references)

A study was undertaken to identify and recommend promising waste treatment technologies whose use would minimize the growing threat to public health and environmental quality brought about by improper disposal of toxic materials. Chlorinolysis appears a very desirable process for eliminating very toxic and hard to dispose of products such as herbicide Orange (2,4-D plus 2,4,5-T). In activated sludge systems, most organics, including pesticides and pesticide isomers, can be decomposed by the bacteria that make up the activated sludge. In one plant using this biomass technique, from 95 to 99% reduction of pesticidal compounds is achieved by holding the waste in an aeration basin for 6 days. The use of catalysis may remove the group or element conferring toxicity to an original chemical structure, thus leaving behind a building block for the synthesis of a useful chemical. Ion exchange media can be adapted to batch, to continuous flow, and to countercurrent continuous-flow operations. A new synthetic polymeric adsorbent (Amberlite XAD4) has been developed for treatment of effluents from the manufacture of pesticides. Photodecomposition is also an important method of degrading pesticides. Herbicides in particular react favorably with the ultraviolet region of the spectrum. Pesticide research on activated carbon adsorption indicates this method would be successful in reducing pesticide concentrations in the waste stream. Removal was generally higher than 90%.

76-1174. Glass, W. I. (PO Box 5896, Auckland, New Zealand). **Dieldrin poisoning: case report.** *N.Z. Med. J.* 81(534): 202-203; 1975. (8 references)

A 35 yr old pest spray operator used a commercial preparation composed of dieldrin mixed with kerosene or kerosene and dieselene mixture for spraying borer. About 172 liters of the mixture was used to treat each house. The average treatment time/house ranged from 2 to 25 hr. Over a five-month period the operator averaged three houses every two days. Immediately prior to his illness he sprayed two houses per day for three consecutive days during the summer when the temperatures were high. During these three days, two accidents occurred. On each occasion the rubber hose of the spray equipment broke and the man was soaked over the thigh and leg portions of his overalls. He quickly removed the clothing, washed, and put on clean overalls on each occasion. The following day he developed a severe frontal headache, became nauseated, and vomited. His appetite deteriorated. Dizziness and sweating followed by diarrhea developed. He lost 6.3 kg over the next 4 days. He became irritable and his memory deteriorated. A fat biopsy was taken 4 weeks after the episode and a level of 7 ppm of dieldrin was found. The symptoms exhibited by this operator were in themselves so nonspecific as to not warrant a diagnosis of dieldrin intoxication. Without the history of his exposure such a diagnosis would not have been considered. The loss of weight, with the relation between dieldrin intoxication and reduced appetite, suggests that forced feeding of a high caloric value food appears to have a place in the treatment of dieldrin poisoning and perhaps also in poisoning by other organochlorine insecticides.

76-1175. Matsushima, S.; Ide, H. (Dep. Health Superv., Saku Gen. Hosp., Usuda, Nagano, Japan). [**A three-year statistical observation of cases of pesticide in toxication in Saku General Hospital.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 7-38; 1974. (9 references) (Japanese)

Clinical cases of pesticide-induced intoxication in Saku General Hospital during the past three years included 58 males and 51 females. The totals were 20, 35, and 54 in 1970, 1971, and 1972. By age group, the forties predominated (37.6%). The most numerous causative pesticides were organophosphates (42.6%), followed by organosulfurs, herbicides, organochlorines, methylcarbamates, copper formulations, organomercurials, and antibiotics. The syndromes consisted of acute poisoning (25.7%), dermatitis (68.8%), conjunctivitis (1.8%), pharyngitis and laryngitis (0.9%), and pigment deposition or disappearance. The direct causes of exposure to pesticides were incomplete protection in application (41.6%), and application under poor health conditions (22.5%). Cases of intoxication due to entrance into pesticide-treated fields were relatively numerous. One case of accidental intoxication (swallowing) occurred when paraquat dichloride had been stored in a vinegar bottle. Cases of suicide (3) occurred in young people. Results of intoxication showed 36 re-

coveries (33.0%) with 34 still under treatment (31.2%). No fatal cases were seen resulting from pesticide application or other agricultural work.

76-1176. Matsushima, S. (Dep. Pestic. Intox., Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Clinical cases of chronic intoxication induced by organophosphorus pesticides. Nervous disturbances.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 39-45; 1974. (26 references) (Japanese)

Due to the banning of organochlorine insecticides, organophosphates and methylcarbamates have become the two major insecticides in agriculture. The chronic toxicity of pesticidies, including organophosphates, has not yet been fully elucidated. It is thought that chronic intoxication caused by organophosphorus pesticides was due to an accumulation of effects rather than to an accumulation of the pesticides themselves. The rapid metabolism and excretion of organophosphorus pesticides in the mammalian body and the irreversible disturbance of cholinesterase were the basis for this conclusion. References are made to an in-depth description of the famous case of "ginger paralysis" induced by tri-*o*-cresyl phosphate and other cases of delayed paralysis induced by organophosphorus compounds and to many cases of nervous disturbances showing chronic progress. In general, cases classified as chronic intoxication have included true chronic intoxication due to continuous pesticide intake and sequelae of acute intoxication. The latter cases seem to be more frequent, and cases due to continuous pesticide intake appear less numerous clinically.

76-1177. Kanda, M.; Matsushima, S. (Dep. Intern. Med., Saku Gen. Hosp., Usuda, Nagano, Japan). [**A case of acute fenthion poisoning.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 50-53; 1974. (2 references) (Japanese)

A case of acute poisoning by ingestion of 0.5 g of 2% fenthion dust in an attempted suicide was described. The patient, a working woman, 33, felt severe pains in the epigastrium and abdomen 3 hr after ingestion, then experienced continued vomiting and diarrhea. After hospitalization 8.3 hr following swallowing of the poisoning her heart rate was 84; blood pressure 110/80; consciousness clear; pupil diameters normal; light reflexes normal; chest and abdomen normal; and there was no spasm or abnormal function in her extremities. However, her mental state was unstable. Conspicuous reduction of serum ChE activity to 0.08 delta pH was observed. She was treated by repeated drip injections of PAM (pralidoxime) and intramuscular injections of atropine sulfate for 10 and 4 days, respectively. Upon release on the 14th day of hospitalization, partial restoration of serum ChE activity to 0.56 Δ pH was observed (erythrocyte ChE activity 0.53). During hospitalization, her serum ChE activity once dropped to O Δ pH. After termination of atropine injections, abdominal pain and diarrhea recurred, showing the effectiveness of atropine.

76-1178. Matsushima, S.; Hagiwara, A.; Ide, H.; Yokoyama, T.; Oshiba, H.; Satsumata, C. (Dep. Health Superv., Saku Gen. Hosp., Usuda, Nagano, Japan). [**Results of health survey of farmers applying pesticides in a vegetable growing area. Part 3.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 54-62; 1974. (Japanese)

Forty-five farm women (30-50 yr) engaging in vegetable growing in a highland village of Nagano Prefecture were divided into two groups, one mainly involved in pesticide application, and the other rarely involved with this job. Predominantly used pesticides were organophosphorous insecticides, PCNB, organosulfurs, and copper sulfate, with an average of 10 applications. No abnormal values were found in blood pressure, serum total protein, GOT, GPT, or ZTT in either group, and no differences of values were shown between the two groups. The frequency of abnormal values of hemoglobin and hematocrit was greater in the first group, which had a lower average value. Thirty percent of the women in both groups showed lower values of serum ChE activity, indicating the absence of chronic intoxication or chronic effects of frequent organophosphorus pesticide application. During the general examination, hypertension, anemia, and rheumatic diseases were observed in both groups. Anemia was significant in the first group, but could not be attributed to pesticide application. In general, the present survey did not reveal that women engaged in pesticide application are less healthy than those who do not apply pesticides.

76-1179. Hayashi, T. (Dep. Ophthalmol., Saku Gen. Hosp., Usuda, Nagano, Japan). [**Experimental studies on ocular disturbances due to organophosphorus pesticides. Part 3. II. Actual state of ocular disturbance in school children in a rural district.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 168-171; 1974. (3 references) (Japanese)

A total of 103 students (53 boys and 48 girls) in the 5th-6th yr classes of primary school in a rural district were subjected to ophthalmologic examination. Twenty-five percent of the children had a visual acuity less than 1.0 (girls were especially affected); almost all were cases of myopia. More than half of the boys and girls demonstrated abnormalities in refraction, and myopia was frequently found in girls. However, there were no children with serious abnormalities of refraction. No abnormal findings were obtained on examination of visual field, cornea, pupil, or fundus.

76-1180. Ayala, J. (Purdue Univ., Lafayette, IN). **Proper disposal of pesticides.** *Pest Contr.* 44(3): 11,29; 1976. (6 references)

Proper disposal of organic pesticides can be accomplished in the pesticide incinerator which must be able to reach 1000°C for a minimum 2 sec dwell time in the combustion zone. The incinerator must have a water scrubber and gaseous emissions system. Ashes should be disposed of in a especially designated landlill, one at which

complete long term protection is provided to surface and subsurface environment. Incineration is not possible for pesticides containing mercury, lead, cadmium, or arsenic; for inorganic pesticides (non-carbon); or for metallic pesticides. These must be disposed of in a specially designated landfill. For certain mobile pesticides, encapsulation prior to burial is recommended. Pesticide containers must also be disposed of by proper methods. Combustible containers should be burned in a pesticide incinerator or buried in a specially designated landfill, assuming they did not previously contain inorganics or metallic pesticides. Noncombustible containers not previously containing inorganics or metallic pesticides should be triple rinsed and, if in good condition, returned to the manufacturer for re-use. Another alternative is to triple rinse, puncture to insure proper drainage, and transport for recycling as scrap metal. They may also be triple rinsed and buried in a sanitary landfill. Containers of inorganics or metallic pesticides should be triple rinsed, punctured, and buried in a sanitary landfill. It not rinsed they must be buried in a specially designed landfill. Anti-coagulant baits can be incinerated with other pesticides or be disposed in a sanitary landfill. Well injection is another type of disposal which allows slow seepage into the sub-surface soil. This type of disposal must be approved by the EPA as well as state and local agencies. There are some commercial chemical waste processing plants which are capable of handling pesticide disposal.

76-1181. Popa, G. (Emergency Clinic, Iasi Inst. Med. Pharm., Iasi, Romania). **Tratamentul intoxicatiei cu organofosforate. [Treatment of organophosphate poisoning.]** *Rev. Med.-Chir.* 78(1): 191-194; 1974. (Romanian)

Detailed instructions are given for treatment of poisoning with organophosphorus compounds, especially parathion. These include diagnostic procedures, principles of treatment, preliminary treatment for inhalation or swallowing of poison, and dosage and administration for atropine, toxogonin (obidoxime), and PAM (pralidoxime). Supplementary procedures are given for treatment of serious respiratory disturbances, acute pulmonary edema, persistent convulsions, acid-base imbalance, hyperkalemia, and vascular collapse. Antibiotics should be administered as protection against bronchopulmonary infections. When chronic intoxication involves atypical digestive disturbances, tendency to tire easily, muscular pain, and an unexplainable tendency toward miosis, then toxogonin or pirangyte should be administered, the dosage corresponding to the patient's intensity of symptoms and response to atropine.

76-1182. Rosca, V.; Balanescu, A.; Stanescu, V.; Pavel, A. (Health Vet. Med. Inspect., Neamt District, Romania). **Aspecte privind unele intoxicatii la animale si albine cu substant chimice folosite in agriculture. [Aspects of certain cases of poisoning in animals and bees from chemicals used in agriculture.]** *Rev. Zooteh. Med. Vet.* 24(3): 86-89; 1974. (6 references) (Romanian)

Reviewed here are a series of works on poisoning from chemical substances used in agriculture in Romania, which includes organochlorine and phosphorus compounds and nitrophenol derivatives used as insecticides, organomercury compounds as fungicides, herbicides, DDT used as pediculocide, and fertilizers. A description is given of symptoms, diagnostic procedures, treatment, and prevention. Poisoning was caused by negligence, by poor judgment in use, and by ignorance. Highest morbidity and mortality from the organochlorine and organophosphate compounds were reported in birds and bees; from nitrophenols in birds, pigs and cattle; from organomercury compounds in sheep; from herbicides (treatment of clover) in sheep; from DDT in calves; and from fertilizers in pigs, cattle and bees. One rare case of sheep poisoning occurred about 50 meters from a deteriorating stable in which a large amount of superphosphate had been stored. The poisoning was chronic in nature and killed 18.9% of the sheep in 3 weeks.

76-1183. Min. Agric. For. (Tokyo, Japan). **[Partial amendment of pesticide safe use standards for agriculture and forestry.]** *Shokubutsu Boeki (Plant Protect.)* 29(12): 501-502; 1975. (1 reference) (Japanese)

On November 7, 1975, a partial amendent to the pesticide safe use standards for agriculture and forestry was officially issued, according to the Pesticide Regulation Act of Japan. The amendment specified a waiting period after application for malathion on peas, seasoning greens, broad bean, and taro of 7 days, with three applications on peas and broad bean and four on seasoning greens. The specified waiting period for dichlorvos on asparagus was 1 day, on grapes and spinach 3 days, and on celery 4 days. The waiting period for chlorfenvinphos on potato was set at 7 days and on cabbage 14 days, with four applications on cabbage and five on potato. The waiting period for captan on eggplant was 1 day and on apples 3 days. The preharvest period for captafol on Japanese pear and apple was set at 7 days, on cabbage 14 days, and on Japanese radish 30 days, with four applications. The preharvest application period and number of applications were amended for pesticides containing fenitrothion and diazinon.

76-1184. Anonymous. **Laws and regulations.** *Soap Cosmet. Chem. Spec.* 52(1): 20; 1976.

Russell Train, EPA administrator, has called for an immediate ban on the production of chlordane and heptachlor for insect control in most agricultural and home situations. Corn farmers will be allowed to use the pesticides to control insects in the 1976 crop through August 1. The chief administrative judge for EPA, Herbert Perlman, had recommended that the notice of intention to suspend the production of the 2 pesticides be dropped due to conflicting evidence presented by the EPA and by Velsicol Chemical Corp., producer of the chemicals. However, EPA has decided to keep the ban in effect while additional testing is done. This could take up to 18 months. Use of the

pesticides for underground termite control around buildings, controlling fire ants and Japanese beetles under Agriculture Department programs, and application on several crops including strawberries and pineapples is still allowed. According to the EPA, the production schedule called for 38 million pounds of the pesticides to be produced this year.

76-1185. Axelson, O.; Sundell, L. (Yrkesmedicinska Kliniken, Regionsjukyuset, Skolgatan, Orebro, Sweden). **Herbicide exposure, mortality and tumor incidence. An epidemiological investigation and Swedish railroad workers.** *Work Environ. Health* 11(1): 21-28; 1974. (15 references)

An epidemiological study of tumor incidence and mortality among Swedish railroad workers exposed to various herbicides showed a slightly dose-dependent and significantly increased tumor incidence and mortality rate among workers exposed to amitrole. Those exposed to phenoxy acids (2,4-D and 2,4,5-T), however, showed only slightly more than the expected tumor incidence and mortality. In the group exposed to amitrole, there was no overrepresentation of cancer of any particular type or location with the exception of two lung cancer cases. Although evaluation of the association between amitrole exposure and increased tumor incidence was confused by the fact that exposure to amitrole was sometimes combined with exposure to diuron and/or monuron, the results suggest the importance of precautions in the use of amitrole. This conclusion is supported by the results of animal studies, which have shown increased thyroid and liver tumors in animals exposed to amitrole.

See also **76-1136** **76-1247** **76-1250**

76-1186. Strezelec, A. (Dep. Agric. Microbiol., Inst. Soil. Sci. Plant Cultivation, Pulawy, Poland). **The influence of glucose on simazine decomposition.** *Acta Microbiol. Pol.* 7(2): 91-96; 1975. (8 references)

Air-dried, noncultivated sandy soil treated with simazine was mixed with water containing various amounts of glucose, and the samples were incubated at 28°C for 2 months. The total number of bacteria,actinomycetes, and fungi were determined twice during that period, and the herbicide residues in the soil were assessed after 0, 2, 4, and 8 weeks by thin-layer chromatography. In other experiments, medium containing simazine and glucose was inoculated with homogenized cultures of *Penicillium citrinum*, and the simazine residues and dry mass of mycelium were determined after 0, 2, 5, and 7 weeks. Simazine exerted a negative influence on the development of bacteria and actinomycetes in the soil, and glucose diminished this negative influence in a dose-dependent manner. In contrast, fungal development was influenced favorably by both simazine and glucose. Glucose also favorably influenced the decomposition of simazine in the soil. In the Penicillium cultures, glucose increased the dry mass increase in the presence and absence of simazine and also increased the rate of disappearance of simazine from the medium.

76-1187. Overcash, R. G.; Lindsey, J. R.; Cassell, G. H.; Baker, H. J. (Birmingham VA Hosp., Birmingham, AL). **Enhancement of natural and experimental respiratory mycoplasmosis in rats by hexamethylphosphoramide.** *Am. J. Pathol.* 82(1): 171-190; 1976. (24 references)

The effects of hexamethylphosphoramide (HMPA, hempa) were studied on Sprague-Dawley rats and on Long-Evans rats known to have indigenous *Mycoplasma pulmonis* infection; uninfected pathogen-free (PF) Fischer rats; and PF and axenic Fischer rats inoculated intranasally with *M. pulmonis* strains having a wide range of virulence. HMPA was given at 100 mg/kg/day, p.o. Treated rats which were infected either naturally or experimentally with virulent *M. pulmonis* showed severe clinical signs of murine respiratory mycoplasmosis (MRM) with mortalities of 25 to 60%. Relatively mild MRM and no deaths occurred in untreated, infected controls. Death was attributed to unusually severe lung lesions of MRM with ulceration of respiratory mucosa and hemorrhage. In conventional rats rhinitis was also increased in severity by HMPA. However, this was not noted in experimentally infected PF or axenic rats. HMPA did not affect the severity of otitis media and tracheitis. With the exception of increased frequency of gross lung lesions, the incidence of lesions of MRM was unchanged. HMPA treatment of rats caused thinning and microulceration of respiratory epithelium in major bronchi without inflammatory lung disease in the absence of *M. pulmonis* infection. HMPA, with or without infection, also caused destruction and fibrous replacement of olfactory epithelium, atrophy of testes, and reduced weight gains. From the results of this study it was concluded that HMPA markedly enhanced both rate of progression and severity of the pneumonia while inconsistently potentiating the rhinitis of MRM in rats.

76-1188. Mollenhauer, H. H.; Johnson, J H.; Younger, R. L.; Clark, D. E. (Vet. Toxicol. Entomol. Res. Lab., Agric. Res. Serv., College Station, TX 77840). **Ultrastructural changes in liver of the rat fed hexachlorobenzene.** *Am. J. Vet. Res.* 36(12): 1777-1781; 1975. (18 references)

Changes in hepatic ultrastructure were observed in outbred male and female Sprague-Dawley rats given 5-25 ppm HCB in the diet for 3-12 mo. The number and severity of the changes increased with dosage and duration of treatment. In the HCB-fed rats, changes were observed in the cellular regions normally containing smooth endoplasmic reticulum (SER) and glycogen. In some animals, the SER proliferated to become the predominant feature in the cell while in others, the SER was apparently replaced by quantities of storage product, presumably glycogen. The proliferation of SER occurred most often in animals given the smaller doses of HCB, while the storage product accumulations were most often observed in rats given the larger doses. The most significant changes were in the mitochondria, which became elongated or swollen. The swollen mitochondria were occasionally as large as nuclei, although usually only a fraction of the mitochondria within a cell appeared abnormal. Storage bodies of 1-4 mm in diameter appeared in some cells. These bodies were surrounded by a double membrane derived from the endoplasmic reticulum and may have been the partly digested remains of degeneration mitochondria.

76-1189. Abou Akkada, A. R.; Yassan, M. A.; Naga, M. (Fac. Agric., Univ. Alexandria, Alexandria, Egypt). **A note on the effect of herbicides on the metabolism and performance of lambs.** *Anim. Prod.* 2(2): 311-313; 1975. (8 references)

Cross-bred Rahmany × Merino castrated male lambs were maintained for 12 weeks on a diet containing no additives, 60 ppm 2,4-D, or 60 ppm M_{13}. The animals were weighed weekly, and every second week, samples of rumen liquor and blood were taken 3 hr after feeding. Neither herbicide affected the concentrations of volatile fatty acids or ammonia in the rumen liquor and hemoglobin components in the blood, or the serum proteins or blood nitrogen balance. Over the first 6 weeks of the experiment, there was a significant increase in live-weight gain in the M_{13}-treated lambs, but this difference was no longer evident at 12 weeks. Dietary 2,4-D had no effect on live-weight gain. These observations are consistent with the previously reported detoxification of 2,4-D and M_{13} by rumen microorganisms.

76-1190. Finlayson, D. G.; Campbell, C. J.; Roberts, H. A. (Res. Stn., Agric., Canada, Vancouver, British Columbia, Canada). **Herbicides and insecticides: their compatibility and effects on weeds, insects, and earthworms in the minicauliflower crop.** *Ann. Appl. Biol.* 79(1): 95-108; 1975. (17 references)

Experiments were conducted to determine the effects of insecticides and herbicides, both alone and in combination, on weeds, on cauliflower growth, maggot damage, yield, and also on aphid and lepidoptera populations, predatory and parasitic beetles, leaf miners, and earthworm populations. The herbicides were applied in two combinations: first, trifluralin at 0.6 kg a.i./ha sprayed on the plots before sowing and immediately incorporated by rotary power harrow or by rotavation, followed by propachlor at 2.2 kg a.i./ha pre-emergence; and second, nitrofen at 2.2 kg a.i./ha and propachlor 2.2 kg a.i./ha both applied pre-emergence. The insecticides and their rates of application included carbofuran at 2.2 to 2.48 kg a.i./ha; chlorfenvinphos at 1.83 to 2.2 a.i./ha; and isofenphos at 0.45 to 2.2 kg a.i./ha. The two combinations of herbicides gave good weed control, with their relative effectiveness depending on the species composition of the weed population. Isofenphos, carbofuran, chlorfenvinphos and fensulfothion were applied as bow-wave treatments. None of these, whether or not in combination with herbicides, adversely affected crop stand or yield. Yield was reduced when either weeds or root-fly maggots (*Hylemya brassicae* (Bouche)) were not controlled. Evidence of herbicide-insecticide interaction was only visible in one experiment. The combination of trifluralin and carbofuran at one location resulted in much poorer control of both weeds and maggots than was found with other combinations. The populations of predatory beetles were not affected by any of the treatments. Earthworms were greatly reduced in number by carbofuran and to a lesser extent by chlorfenvinphos. No noticeable effect was seen on aphids, lepidopterous larvae, or leaf miners, with the exception of one carbofuran experiment.

76-1191. Johnson, M. K. (Biochem. Mech. Sect., U.K. Med. Res. Counc. Toxicol. Res. Unit, Carshalton, Surrey, England). **Organophosphorus esters causing delayed neurotoxic effects. Mechanism of action and structure/activity studies.** *Arch. Toxicol.* 34(4): 259-288; 1975 (64 references)

Evidence is reviewed that the initial biochemical event leading to delayed neurotoxicity is phosphorylation of the active site of a specific enzyme called Neurotoxic Esterase. This is followed by a bond cleavage (?hydrolytic) leading to formation of a mono-substituted phosphoric acid residue on the protein. The mechanism by which some phosphinates protect hens against neurotoxic compounds is explained. Assay of effects of compounds on Neurotoxic Esterase activity of hen brain in vitro and in vivo provides a quick biochemical screen to supplement the 3-week clinical test. This test provides an estimate of safety margin for compounds which give negative results in the clinical test and are currently used as pesticides, plasticizers, etc. Simplified assay procedures are being developed. Data is now available for the biochemical and neurotoxic activity of many compounds. This provides a basis for structure/activity predictions; neurotoxicity data published since 1930 has been assessed in this light. (Author abstract by permission)

76-1192. Grunow, W.; Altmann, H. J.; Boehme, C. (Bundesgesundheitsamt, Max-von-Pettenkofer Inst., Abt. Toxicol., Berlin, Germany). **Ueber den Stoffwechsel von 3-amino-1,2,4-triazol in Ratten. [Metabolism of 3-amino-1,2-4-triazole in rats.]** *Arch. Toxicol.* 34(4): 315-324; 1975. (44 references) (German)

3-Amino-1,2,4-triazole [5-^{14}C] (amitrole) was given p.o. to rats as a single dose of 50 mg/kg body weight. Excretion in urine and feces was followed during a period of 3 days. Within the first 24 hrs the main part of the radioactivity was found in the urine as unchanged amitrole. 3-Amino-5-mercapto-1,2,4-triazole and 3-amino-1,2,4-triazolyl-(5)-mercapturic acid were isolated from urine and identified by comparison with synthetic compounds. The total amount of these metabolites in the urine was about 6% of the dose. The metabolic pathways of amitrole and the possible relations between biotransformation and toxicity are discussed. (Author abstract by permission)

76-1193. Mia, A. S.; Latif, A.; Ali, K. M. (Dep. Vet. Med. Surg., Bangladesh Agric. Univ., Mymensingh, Bangladesh). **Comparative toxicity of certain organophosphorus insecticides in goat.** *Bangladesh J. Biol. Agric. Sci.* 2(1): 17-19; 1973. (4 references)

The toxicity of five organophosphorus insecticides was studied in the goat. Malathion, bidrin (dicrotophos), dimecron (phosphamidon), DDVP (dichlorvos), and diazinon were given orally to determine the minimum lethal and toxic doses. Bidrin, dimecron, and DDVP were 9, 8.4, and 3.6 times more toxic, respectively, than malathion. Diazinon was about 25% as toxic as malathion for goats on the basis of the dose recommended against common agricultural pests. Cholinesterase activities were reduced to about 60% of normal within a few hours after administration of the MLD50 of the insecticides. Bidrin was the most toxic, followed by dimecron, dimecron, DDVP, malathion, and diazinon. The MLD50 of bidrin, dimecron, DDVP, malathion, and diazinon for a 20-pound goat was equivalent to the amount normally sprayed on 3.5, 3.7, 8.3, 31, and 15 sq. yd. of area, respectively. This indicates that little or no safety factor exists in cases of bidrin and dimicron, and some poisoning will result in animals gaining access to fields recently sprayed with these chemicals. There is a marginal safety factor in the case of DDVP and a considerable safety factor in cases of malathion and diazinon. It is suggested, in view of the acute shortage of animal protein for feeding the people of India, that insecticides be selected for use which are least toxic to the livestock and fish, but effective enough to protect the crops against the pests. Other methods of plant protection must also be considered.

76-1194. Bus, J. S.; Aust, S. D.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Superoxide- and singlet oxygen-catalyzed lipid peroxidation as a possible mechanism for paraquat (methyl viologen) toxicity.** *Biochem. Biophys. Res. Commun.* 58(3): 749-753; 1974. (18 references)

Paraquat was reduced by mouse lung microsomes when incubated under anaerobic conditions with NADPH. The reaction was inhibited by the addition of rabbit antibody to rat liver NADPH-cytochrome c reductase. In the presence of NADPH and NADPH-cytochrome c reductase, paraquat increased the in vitro peroxidation of rat liver microsomal lipid, and the peroxidation was inhibited by supejoxide dismutase and the singlet oxygen trapping agent 1,3-diphenylisobenzofuran. It is suggested that paraquat toxicity may be mediated through the transfer of a single electron from reduced paraquat to oxygen, and thus from superoxide ion. Singlet oxygen may form from the superoxide and subsequently react with tissue lipid to form fatty acid hydroperoxides.

76-1195. Forster, M. S.; Wilder, E. L.; Heinrichs, W. L. (Biol. Dep., Pacific Lutheran Univ., Tacoma, WA 98447). **Estrogenic behavior of 2(*o*-chlorophenyl)-2-(*p*-chlorophenyl)-1,1,1-trichloroethane and its homologues.** *Biochem. Pharmacol.* 24(21): 1777-1780; 1975. (31 references)

Eight chlorinated hydrocarbons were tested for their ability to complete with ^{3}H-estradiol-17β for specific binding proteins in uterine cytoplasm from immature rats. The binding was assayed on 5-20% sucrose density gradients. 2(*o*-chlorophenyl)-2- (*p*-chlorophenyl) -1,1-dichloroethylene (*o,p'*-DDE) (0.14 m*M*) competed with ^{3}H-estradiol-17β (8.7 n*M*) for binding to the "8 S receptor" in the cytoplasm. 2,2-Bis-(*p*-chlorophenyl)-1,1,1-trichloroethane (*p,p'*-DDT),2,2-bis-(*p*-chlorophenyl)-1,1-dichloroethylene (*p,p'*-DDE), 2,2-bis-(*p*-chlorophenyl)-1,1- dichloroethane (*p,p'*-DDD), 2(*m*-chlorophenyl)-2-(*p*-chlorophenyl) -1,1-dichloroethane (*m,p'*-DDD), 2(*o*-chlorophenyl)-2- (*p*-chlorophenyl)-1,1-dichloroethylene (*o,p'*-DDD), and bis(*p*-chlorophenyl)-1,1-dichloroacetate (DDA) did not compete at 0.14 m*M*. Transfer of the receptor-bound compounds into the nuclei was examined using similar competition techniques. *o,p'*-DDT and *o,p'*-DDE competed with estradiol binding in the nuclei. These studies indicate that *o,p'*-DDT and *o,p'*-DDE at high concentrations act as estrogens as measured by their ability to compete with estradiol-17β for binding to the uterine cytoplasmic receptor and in the transfer and binding of estradiol in the nuclei of uterine cells. (Author abstract by permission)

76-1196. Norman, B. J.; Neal, R. A.* (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ., Nashville, TN 37232). **Examination of the metabolism in vitro of parathion (diethyl *p*-nitrophenyl phosphorothionate) by rat lung and brain.** *Biochem. Pharmacol.* 25(1): 37-45; 1976. (27 references)

These studies have indicated there is present in rat lung microsomes a mixed-function oxidase enzyme system capable of metabolizing parathion to paraoxon and to diethyl phosphorothioic acid. In addition, analogous to previous results using rat liver microsomes, the sulfur atom released in the metabolism of parathion to paraoxon was found to covalently bind to lung microsomes. In contrast to liver, the metabolism of parathion by rat lung microsomes is not inducible by pretreatment of the animals with phenobarbital or 3-methylcholanthrene. The metabolism of parathion by lung microsomes is stimulated by NADPH and oxygen and is inhibited by carbon monoxide, anaerobic conditions, SKF-525A, and piperonyl butoxide. There is also present in a particulate fraction of rat brain equivalent to microsomes an enzyme or enzyme system capable of metabolizing parathion to paraoxon and to diethyl phosphorothioic acid. The metabolism of parathion to paraoxon by rat brain microsomes is also accompanied by the release and covalent binding of the sulfur atom of parathion. The activity in rat brain microsomes is stimulated by oxygen and NADPH and inhibited by carbon monoxide, anaerobic conditions, SKF-525A, and piperonyl butoxide. This data suggests that cytochrome P-450-containing mixed-function oxidase enzyme systems are responsible for the NADPH-stimulated catalytic activity toward parathion found in rat lung and rat brain microsomes. (Author abstract by permission)

76-1197. Welsch, F. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Uptake of acetylcholine by human placenta fragments and slices from guinea pig and rat placenta.** *Biochem. Pharmacol.* 25(1): 81-89; 1976. (43 references)

Fragments of human term placenta took up [^{3}H]acetylcholine (ACh) into the intracellular water fraction against a concentration gradient when incubated in a medium which contained 10 μM paraoxon as an inhibitor of cholinesterases. Intracellular concentrations rose to levels 3- to 4-fold over the concentration in the medium in a time- and temperature-dependent manner. The ACh uptake was saturable and followed the Michaelis-Menten equation. It required metabolic energy and was markedly reduced by drugs and conditions which decreased cell levels of ATP. Concentrative uptake was inhibited by alterations in the ionic environment as introduced by high K, Li, Rb, and Cs ion levels. Slices from guinea pig placenta reached intracellular concentrations which were only equal to the concentration in the incubation medium, suggesting equilibration by diffusion, while rat placenta slices concentrated ACh more slowly than human placenta and reached ratios of 2.0. These species variations further confirm known differences of the cholinergic system in placenta and stress the need for caution in extrapolating findings from the placenta of one species to another. (Author abstract by permission)

76-1198. Svidritskaya, N. N.; Smusin, Ya. S.; Babakhanyan, R. V. (I. P. Pavlov First Leningrad Med. Inst., Leningrad, USSR). **K toksikologicheskoy kharakteristike dvukh novykh ryadov fosfororganicheskikh soediniy. [Toxicological characteristics of two new series of organophosphorus compounds.]** *Biol. Zh. Arm.* 27(8): 109-110; 1974. (Russian)

The general toxic, cholinesterase-inhibiting, and bronchospastic action of *O,O*-dipropyl and *O,O*-dibutyl-*s*-(β-arylmethylaminoethyl) thiophosphate iodomethylates of different types and with various localizations of substituents on the phenyl radical was studied in mice and cats. The LD50 in mice was between 0.1 and 0.9 mg/kg for both series. Changes in the location of the substituents in the phenyl radical influenced the toxicity, but the elongation of the alkoxyl radical in the phosphorylating part of the molecule reduced the toxicity. All compounds significantly inhibited the cholinesterase activity in the transversostriated muscles, but they caused only slight inhibition in the central nervous system. The cholinesterase inhibition was moderate in the liver. All compounds tested exerted powerful bronchospastic action on cats, but a few compounds had a weak effect. Correlation was found between toxicity and the minimal lethal bronchospastic dose. While preliminary or simultaneous vagotomy did not influence the course of the bronchial spasm, atropine fully suppressed the bronchial spasm when given during spasm, and exerted a protective action when administered before poisoning. The bronchial spasm was suppressed by the reactivator TMB-4 by 86-90% when administered i.v. during the crisis.

76-1199. Cahalan, M. D.; Shapiro, B. I. (Physiol. Dep., Univ. Pennsylvania, Philadelphia, PA 19104). **Current and frequency dependent block of sodium channels by strychnine.** *Biophys. J.* 16(2, pt. 2): 76a; 1976.

Perfused, voltage-clamped, squid axons were used to study the characteristics of sodium channel block by strychnine. A rapid inactivation of sodium current for potentials beyond the sodium equilibrium potential was caused by internally applied strychnine (0.1 to 1 m*M*) or *n*-methyl strychnine. Block by strychnine was dependent on the direction of sodium current through the membrane. There was very little block of inward sodium current with high external sodium at the same potentials for which there was considerable block of outward sodium current with low external sodium. These findings support the theory that strychnine can be knocked out of open sodium channels by inward sodium movement. Sodium tail current kinetics are altered in parallel with block by strychnine. Following inactivation induced by strychnine, there is a pronounced hook in the tail current, and the channels close more slowly. Gating current associated with both activation and closing of sodium channels was also reduced by strychnine. In axons with a normal inactivation process, sodium current is frequency dependent with strychnine inside, and recovery from frequency dependent block is slow. In pronase-treated axons this frequency dependence disappears, and recovery from strynchine-induced inactivation proceeds with a rapid phase and a slower phase on the order of 100 msec. It may be that strynchnine becomes trapped in the channel by the gating mechanism, and that the release of strychnine is much slower if the inactivation process in intact.

76-1200. Kadota, T.; Kohda, H.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). **Subchronic toxicity studies of sumithion, sumioxon and *p*-nitrocresol in rats and 92 week feeding study of sumithion with special reference to change of cholinesterase activity.** *Bochu-Kagaku (Sci. Pest Contr.)* 40(2): 38-48; 1975. (19 references)

Wistar rats were kept up to 92 wk on diet with 0-150 ppm sumithion (fenitrothion) 0-50 ppm sumioxon (fenitroxon), or 0-1500 ppm *p*-nitrocresol. Behavior, mortality, body weight, food and water consumption, organ weight, hematology, and urinalysis were not adversely affected by any of the pesticides during a 6-mo feeding study. Sumithion and sumioxon however, produced dose-related reductions in the plasma, red blood cell, and brain cholinesterase activity, particularly in the females. Histopathological examinations showed no changes in any organs attributable to pesticide treatment. In a 92-wk feed study, sumithion at 5 ppm produced a slight and transitory inhibition of the plasma cholinesterase activity, and at 10 ppm the inhibition was significant. Even at 10 ppm, the brain and plasma enzyme levels were not significantly affected. Sumithion had no adverse effects on mortality or histopathology.

76-1201. Kadota, T.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). **Acute and sub-acute toxicity of sumithion in Japanese quails.** *Bochu-Kagaku (Sci. Pest Contr.)* 40(2): 54-58; 1975. (10 references)

Sumithion (fenitrothion) in surfactant was administered orally to 7-8 wk-old male and female Japanese quails at a dose level of 1 mg/100 g body weight. In another study, sumithion was added at a rate of 1.5-50 ppm to the diet of 4-5 wk-old Japanese quails; the experimental diet was continued for 4 wk, after which the birds were returned to a basal diet for 8 wk. The LD50 value of sumithion was 115 mg/kg in male and 140 mg/kg in female quails. There were no deaths or signs of toxicity during the 4 wk feeding study; however, the blood and brain cholinesterase activity was significantly depressed at sumithion levels of 15 ppm or greater. The cholinesterase activity returned to normal within 2-4 wk on the basal diet. Egg-laying was only slightly affected by 50 ppm sumithion, but the rate was inhibited to 1/3 control levels at 150 ppm; return to control values was observed within 2 wk on the basal diet. The results suggest that sumithion residues in crops or fish will not have any ill effects on wildlife.

76-1202. Danilov, A. E.; Ivanov, Y. J.; Michelson, M. J. (Pharmacol. Lab., Sechenov Inst. Evolutionary Physiol. Biochem., Acad. Sci., Leningrad, USSR). **The influence of motor nerve tetanization on the effect of organophosphorus cholinesterase inhibitors on neuromuscular transmission.** *Br. J. Pharmacol.* 56(1): 115-123; 1976. (36 references)

Changes in the activity of the synaptic cholinesterase (ChE) of the anterior tibial muscle of the anes-

thetized cat were detected by recording changes in the blocking activity of acetylcholine (ACh) and comparing them with the blocking activity of i.a. or i.v. carbaminoylcholine (carbachol). After the administration of organophosphorus inhibitors (OPI) of ChE, the ACh blocking dose diminished 500-2000-fold, but the carbachol blocking dose did not change. Four-six hr after the OPI injection, the ACh blocking dose increased again 8-15 fold, but the blocking dose of carbachol remained unchanged. The transmission of high frequency impulses improved after OPI in parallel with the decrease in the ACh blocking activity. Thus, the synaptic ChE was partly restored within a few hr after OPI inhibition. Tetanization of the motor nerve (50-60 Hz, 10 min), started simultaneously with the i.v. injection of OPI (armine, Gd-42) diminished the impairment of neuro-muscular transmission. On the side of tetanization, the ACh blocking action was less pronounced and the transmission of high frequency impulses better than on the control side. Thus, the tetanization produced some protection of synaptic ChE against OPI inhibition. The protective effect was absent when the tetanization was performed before OPI injection or was started 10-20 min after the injection. The protective effect of tetanization was also observed in the isolated rat phrenic nerve diaphragm preparation.

76-1203. Winston, G. W.; Pardini, R. S. (Div. Biochem., Univ. Nevada, Reno, NV 89507). **Inhibition of mitochondrial electron transport systems by phosvel and some environmental conversion products.** *Bull. Environ. Contam. Toxicol.* 15(1): 19-23; 1976. (12 references)

The activities of the NADH-oxidase and succinoxidase enzyme systems in heavy beef heart mitochondria (HBHM) were determined manometrically in the presence and absence of phosvel (leptophos) and its environmental conversion products. Phosvel phenol, phosvel oxon, and the potassium salt of phosvel depressed the NADH-oxidase activity to 8.9, 9.5, and 12.3% of control values, whereas phosvel, phenylphosphonic acid, and *o*-methylthiophenylphosphonic acid depressed this activity to only 77.5, 92.1, and 81.9% of control values. Phosvel phenol, phosvel oxon, and potassium salt of phosvel also depressed the succinoxidase system by 29.2, 10.4, and 19.5%, the other three compounds having no or a slightly stimulatory effect. Phosvel phenol and the potassium salt of phosvel inhibited electron transport preferentially at complex I and secondarily at complex II, while phosvel oxon was a more potent inhibitor of complex II.

76-1204. Paris, D. F.; Lewis, D. L. (Freshwater Ecosystems Branch, Southeast Environ. Res. Lab., Athens, GA 30601). **Accumulation of methoxychlor by microorganisms isolated from aqueous systems.** *Bull. Environ. Contam. Toxicol.* 15(1): 24-32; 1976. (13 references)

The accumulation and desorption were studied of methoxychlor by bacteria (*Flavobacterium harrisonii*, *Bacillus subtilis*), fungi (*Aspergillus* sp.), and algae (*Chlorella pyrenoidosa* 395) in aqueous solution. Analysis was by electron capture gas-liquid chromatography. The methoxychlor concentration decreased rapidly in the supernates of the bacerial and algal cultures, reaching equilibrium within 30 min. The amount sorbed remained the same at the 24-hr sampling time. Equilibrium was reached within 16 hr in the fungal system. The minimum values for *k*e ranged from 0.1 mg/kg/hr for *Aspergillus* sp. to 10 ml/mg/hr for *B. subtilis* and *C. pyrenoidosa*. Since autoclaved cultures of bacteria, fungi, and algae sorbed at least as much pesticide as the viable cells, the sorption process was not metabolic. In desorption experiments, equilibrium was achieved within the same period of time as in the sorption experiments, and the distribution coefficients were the same. The distribution coefficients were also similar when algae, protozoa, and bacteria were studied in natural river water.

76-1205. Hoben, H. J.; Ching, S. A.; Casarett, L. J.; Young, R. A. (Dep. Pharmacol., Univ. Hawaii, Honolulu, HI 96816). **A study of the inhalation of pentachlorophenol by rats. Part I: a method for the determination of pentachlorophenol in rat plasma, urine and tissue and in aerosol samples.** *Bull. Environ. Contam. Toxicol.* 15(1): 78-85; 1976. (9 references)

A simple method was developed for the rapid determination of pentachlorophenol (PCP) in tissue, blood, urine, and aerosol samples. Blood was removed from the inferior vena cava of anesthetized rats, and urine was collected in graduated cylinders placed under the animals' collection cages. The whole organs were removed from exsanguinated rats, disintegrated in 5 *N* KOH, homogenized, and washed with extracted water. The air-aerosol mixture was collected through two impingers, the first of which contained 0.1 *N* KOH. Pesticide isolation was achieved via extraction with benzene or hexane after acidification and derivatization. Interfering impurities were removed by elution on a chromatoflex florisil column. Determination was on an electron capture gas chromatograph. Recovery and accuracy were good, and analysis time per sample was considerably reduced. Confirmation was achieved by mass spectroscopy.

76-1206. Hoben, H. J.; Ching, S.; Casarett, L. J. (Dep. Pharmacol., Univ. Hawaii, Honolulu, HI 96816). **A study of the inhalation of pentachlorophenol by rats. Part II: a new inhalation exposure system for high doses in short exposure time.** *Bull. Environ. Contam. Toxicol.* 15(1): 86-92; 1976. (2 references)

In initial inhalation experiments with pentachlorophenol, an ultrasonic atomizer and the Lauterbach nebulizer were used to generate an atomized solution. As this exposure system proved inadequate, a generator which exhibited consistent reproducibility and generated high concentrations of aerosol was developed. The major components of the aerosol generator are an air chamber, air jets, ascending liquid tubes, an air tube, and

two aerosol chambers. The aerosol is generated by compressed air aspiration, and the larger droplets are removed by a cyclone separation. The exposure chamber has 12 inhalation sites separated from the 12 animal containers by rubber seals, which insure inhalation as the only route of exposure. During experimental operation of the exposure system, the aerosol droplets which reached the chamber were so small as to leave no liquid residue on the bottom of the chamber. Although there were small differences in the concentration of airborne solute between exposure sites, these differences were not significant in terms of the dose received per animal. To achieve reproducible aerosol outputs, the generator had to be cold before the start of each run. The PCP output stood in a linear relation to the exposure time for the time periods tested (0-45 min).

76-1207. Fang, S. C.; Fallin, E. (Dep. Agric. Chem., Oregon State Univ., Corvallis, OR 97331). **The binding of various mercurial compounds to serum proteins.** *Bull. Environ. Contam. Toxicol.* 15(1): 110-117; 1976. (15 references)

The equilibrium dialysis technique was used to study the binding of ^{203}Hg-labeled mercuric ion, methylmercuric chloride (MMC), ethylmercuric chloride (EMC), and phenylmercuric acetate (PMA) to serum albumin from six mammalian species, bovine hemoglobin, and bovine γ-globulin. Both MMC and EMC bound only weakly to serum albumin and γ-globulin, but bound more strongly to hemoglobin. Mercuric ion bound very strongly to both albumin and hemogobin and weakly to γ-globulin. PMA bound most strongly to albumin and least strongly to γ-globulin. The available binding sites on the serum albumins varied according to species from one to three per molecule of protein. Similarly, the human and horse albumins had only a single binding site class for mercuric ion, while the ovine, porcine, rabbit, and ovine proteins had two classes. Human serum albumin had the lowest binding affinity for all four mercurial compounds, indicating that it was not as tightly bound to these compounds as were the serum albumins of the other five species.

76-1208. Bean, J. R.; Hudson, R. H. (U.S. Fish Wildlife Serv., Wildlife Res. Cent., Denver, CO 80225). **Acute oral toxicity and tissue residues of thallium sulfate in golden eagles, *Aquila chrysaetos*.** *Bull. Environ. Contam. Toxicol.* 15(1): 118-121; 1976. (7 references)

Three immature golden eagles (*Aquila chrysaetos*) were fasted for 3 days then given a single dose of thallium sulfate (60-120 mg/kg), inserted in a gelatin capsule to the level of the proventriculus. The birds were offered fresh food 2 hr after treatment. Clinical signs of intoxication appeared the day after treatment and included loss of muscular coordination, imbalance, reluctance to move, hyporeactivity, loss of appetite, belligerence, fear-threat displays, falling, debilitation, loss of righting reflex, dropping of the eyelid, distress calls, slow and labored breathing, and immobility. The two birds given 120 mg/kg died 6.5 and 4.5 days after treatment, and the bird given 60 mg/kg showed signs of remission by day 4. A total of 435 mg of thallium was recovered from the body of one of the birds that died, and 12.5 mg was recovered from its feces. The results indicated considerable absorption and a slow rate of excretion during the 4.5 days before the death of this individual.

76-1209. Ariaratnam, V.; Georghiou, G. P. (Dep. Entomol., Univ. California, Riverside, CA 92505). **Carbamate resistance in *Anopheles albimanus*. Penetration and metabolism of carbaryl in propoxur-selected larvae.** *Bull. WHO* 52(1): 91-96; 1975. (14 references)

Increased metabolism and reduced penetration were studied as possible mechanisms of resistance to carbaryl in a strain of *A. albimanus* from El Salvador. Carbamate and organophosphorus resistance had been induced in this strain by laboratory selection with propoxur. Thin layer chromatography revealed 3 metabolites inside the larvae as well as in the medium: *N*-hydroxymethylcarbaryl, 5,6-dihydro- 5,6- dihydroxycarbaryl, and an unidentified metabolite. When the quantities of metabolites and residual carbaryl were expressed as percentages of the total carbaryl administered, it was noted that little carbaryl penetrated the larvae. The percentage of each metabolite recovered in the resistant strain was somewhat higher than that in either the parental or the susceptible strain. The highest percentage of metabolites was in conjugated and water-soluble form in all 3 strains and was higher in the resistant and susceptible strains than in the parental strain. Among the organosoluble metabolites, *N*-hydroxymethylcarbaryl predominated in both the resistant and parental strains, whereas in the susceptible strain there was slightly more 5,6-dihydro- 5,6-dihydroxycarbaryl than *N*-hydroxymethylcarbaryl. About twice as much 5,6-dihydro- 5,6- dihydroxycarbaryl plus the unknown metabolite was detected in the resistant as the parental strain. Penetration of carbaryl-$NH^{14}CH_3$ into the parental and susceptible strains in the first half hr was 1.75 times greater than into the resistant strain. At 1 hr the penetration into the parental strain was about 1.6 times that into the resistant strain. The lower rate of penetration into the resistant strain during the early stages of exposure may account in part for the higher resistance in this strain. A lower penetration rate would result in gradual release of the insecticide within the insect, allowing time for the defense mechanisms to counteract the toxicant. However, in view of the small differences in metabolism and penetration rates noted in this study, it is concluded that some other as yet unidentified mechanisms are largely responsible for the very high level of carbamate resistance in the resistant strain.

76-1210. Groch, L.; Svobodova, Z. (Natl. Inst. Vet. Sci., Brno, Czechoslovakia). **Histopatologicke zmeny u ryb intoxikaci organofosforecnymi pesticidy. [Histopathological studies in fish poisoned with organophosphate pesticides.]** *Cesk. Hyg.* 19(9): 422-444,465-466; 1974. (2 references) (Czech)

Histopathological changes were investigated in young carp (*Cyprinus carpio* L.) after intoxication with organophosphorus insecticides. Besides a control group, three groups were placed in solutions of the following for 48 hours: metathion E-5 (active ingredient content 43% fenitrothion) 0.096 ml/l; Brenvinyl E-50 (active ingredient content 50% dichlorvos) 0.051 ml/l; and Decemtion P-6 (active ingredient content 6% phosmet) 191 mg/l. Five pieces of Kr-1 were placed in each of the solutions. The group intoxicated with metathion E-50 showed vasodilation of the gill ocvers with blood congestion and venostasis, and vacuolation of the upper respiratory epithelia and hepatocytes. Insufficient coloring of the pancreatic acinar cells, dilation of renal tubules, and spreading of the myocardium were also found. Vasodilation and venostasis of the gills, damaged respiratory epithelia, vacuolation of the hepatocytes, and fragmentation and insufficient coloring of the musculature were noted in the group intoxicated with Brenvinyl. Necrobiotic changes in the liver cells, vacuolation of renal tubules, dystrophic changes in the upper respiratory epithelia, and vacuolation of the hepatocytes were observed in the group intoxicated with Decemtion P-6.

76-1211. Merali, Z.; Kacew, S.; Koch, R. B.; Singhal, R. L. (Dep. Pharmacol., Fac. Med., Univ. Ottawa, Ottawa, Ontario, Canada). **Inhibition of rat liver adenylate cyclase by tricyclohexylhydroxytin (plictran).** *Comp. Gen. Pharmacol.* 6(4): 299-301; 1975. (10 references)

The miticide, plictran, was studied to see if it promotes the biotransformation of ATP to cyclic AMP by stimulation of the hepatic enzyme, adenylate cyclase. Hepatic tissue homogenates were incubated with plictran at 0.1 p*M*, 10 p*M*, 1 μM, and 0.1 m*M* concentrations. Rat hepatic adenylate cyclase was sensitive to the in vitro action of the chemical. The incubation at 1 μM concentration resulted in a 50% inhibition of the enzyme. The basal form of adenylate cyclase was more sensitive to plictran than the fluoride-stimulated enzyme. Inhibition of adenylate cyclase by this acaricide was time-dependent with significant decreases being detected as early as 10 min following in vitro exposure to the chemical.

76-1212. Mohan, S. T. (Sch. Life Sci., Jawaharlal Nehru Univ., New Delhi, India). **Cytological effects of fungicides, plantvax and vitavax on somatic cells of *Allium cepa*.** *Curr. Sci.* 44(22): 813-814; 1975. (5 references)

Two systemic fungicides, vitavax and plantvax, were tested for their cytological effects on onion root tip cells. Onion bulbs with intact roots were treated with 0.5% solutions of these chemicals for 1 hr at 26°C and the roots were fixed in 1:3 acetic alcohol after washing thoroughly in water. The mitotic index was significantly lower in the treated cell population compared to controls and there were significant differences in mitotic index between the two fungicidal treatments. Plantvax treatment resulted in greater frequency of abnormal anaphase and telophase cells compared to that of vitavax. Plantvax treatment resulted in the induction of polyploidy and binucleate cells. Differential contraction of chromosomes was noted in both treatments. The cytological effects resembled the aberrations caused by radiation and other mutagenic treatments. Information on the cytological damage and recovery due to widely used fungicides, pesticides, and herbicides on various crops will be useful in understanding the mechanisms of cytological damage and recovery and will also have implications for environmental pollution.

76-1213. Bhunya, S. P.; Behera, J. (Post Grad. Dep. Zool., Utkal Univ., Vani Vihar, Bhubaneswar-4, Orissa, India). **Centromeric sensitivity of mouse chromosomes to the systemic insecticide dimethoate (Rogor).** *Curr. Sci.* 44(23): 859-860; 1975. (6 references)

Adults of both sexes of *Mus musculus* were injected with dimethoate. In treated animals, along with other aberrations, centromeric fission and stretching were predominant. Centromeric fission was more frequent than centromeric stretching. The extent of chromosomes affected with breakage at centromere ranged from 1 to 38%. Centromeric stretching was observed in a good number of cells. The frequency of both types was highest at 24, moderate at 48, and least at 72 hr after the two doses. The results of this study indicate that the action of dimethoate is specific to centromeric region and is of non-random type. The aberrations appear to result from the direct action of dimethoate on the centromeric heterochromatin.

76-1214. Weiss, J. S. E. V. (Author address not given). **The morphological changes and survival effects observed among monkey kidney cells, Girardi heart cells, and rainbow trout gonad cells, in vitro, in response to exposure to various herbicides.** *Diss. Abstr. Int. B* 36(8): 3736; 1976.

Cultured monkey kidney cells, Girardi heart cells, and rainbow trout gonad cells were exposed to 10, 50, 100, or 500 ppm of various herbicides for 24, 72, or 120 hr, then examined by light and electron microsocopy. Dalapon caused complete inhibition of mitotic activity and severe reduction in cell survival, reduced nuclear size, increased nuclear staining, increased peripheral nuclear chromatin, disrupted nuclear envelope, decreased numbers of visible nucleoli, decreased staining capacity of the cytoplasm, reduced amounts of endoplasmic reticulum, Golgi apparatus, and mitochondrial components, and cytoplasmic vacuolization. After fenuron treatment mitotic activity and cell survival declined and metaphase blockage was observed. Low fenuron concentrations and short exposure times enhanced elaboration of organelles associated with protein synthesis. Greater concentrations and exposure times reversed this and produced ribosome extrusion. Exposure for up to 72 hr to 10 or 50 ppm 2,4-D stimulated mitotic activity and cell survival. Higher concentrations and longer exposure reversed these trends, with appearance of damaged, vacuolated cells. With all diquat treatments mitosis ceased within 24 hr and cell survival de-

creased sharply, with intense nuclear staining, peripheral chromatin buildup, nucleolar disruption, nuclear envelope disruption, loss of ER, ribosomes and mitochondria, and cytoplasmic vacuolization. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-3022.)

76-1215. Salk, M. S. (Univ. Louisville, Louisville, KY). **The effects of selected pesticides on ten isolates of terrestrial algae.** *Diss. Abstr. Int. B* 36(8): 3749; 1976.

Ten algal isolates were obtained from soil into axenic culture and placed into defined media containing from 0 to 50 ppm of DDT, 2,4-D, 2,4,5-T, rotenone, or malathion (in two purities, 95 and 99%). For nine of the isolates, growth was measured photometrically every two weeks for a period of two months. Because of the twisted growth form of the tenth isolate, a visual estimation was used to measure its growth over the same period of time. The results of the experiments in the light were as follows: 1) 2,4-D and 2,4,5-T were generally neutral in their growth effects. However, both stimulated growth of two isolates, and 2,4,5-T inhibited the growth of two other isolates while 2,4-D inhibited only one. 2) Rotenone and DDT had mixed effects; rotenone inhibited five, stimulated three, and did not affect two isolates, while DDT inhibited four, stimulated one, and had no effect on five isolates. 3) Malathion was neutral toward one isolate and reduced the growth of all others. 4) In several cases, the isolates appeared to use the pesticides to supplement their growth. Two of the isolates were better able to withstand the effects of the pesticides and tended to be stimulated more often than the others. None of the algae were able to use any of the pesticides as a sole carbon source when grown in defined media in the dark for two months. Several isolates did not survive under these conditions, and none of the isolates survived in a 10 ppm DDT solution. The effect that pesticide use may have on natural populations of soil algae is discussed. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 75-25,475).

76-1216. Ahmed, F. E. M. M. (Ohio State Univ., Columbus, OH). **Environmental genetics: a model to investigate pollutants producing genetic damage.** *Diss. Abstr. Int. B* 36(8): 3737; 1976.

A new approach has been developed for screening environmental pollutants which produce genetic damage, using molecular and radiation biophysics to yield results in shorter times and with lower costs. Human fibroblasts VA-4 (transformed with SV-40 virus) were used for DNA repair studies. Chinese hamster cells V-79 (spontaneously transformed) were used for mutation studies because of their diploid nature. Unscheduled DNA synthesis was studied autoradiographically, with hydroxyurea added to prevent scheduled DNA synthesis. Thirteen compounds commonly used in agriculture were tested: lindane, rotenone, chlordane, heptachlor, heptachlor epoxide, aldrin, dieldrin, carbaryl, diquat, 2,4-D, dimethoate, and captan. Metabolic activation of these compounds was also tried. The liver microsomal fraction was used and cofactors NAD, NADP and glucose-6-phosphate were added. The nitrogen fixing bacterium *Azotobacter vinelandii* normally found in soil was used to metabolically increase the activity of carbaryl with no noticeable effect. Some of the compounds behaved as ultimate carcinogens and did not require metabolic activation. Some behaved as precarcinogens which require activation before producing their effect, whereas others did not induce unscheduled DNA synthesis. Four compounds were selected for detailed analysis by a bromodeoxyuridine photolysis method: carbaryl, chlordane, dieldrin, and 2,4-D. These chemicals induced DNA damage, and bromodeoxyuridine was incorporated in the damaged region. In all cases the chemicals increased the frequency of mutation, as indicated by sensitivity of the plasma membrane to ouabain. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-3363).

76-1217. Vancil, J. E. (Univ. Tennessee, Knoxville, TN). **Acute toxicity of 2,4,5-T to three species of limnetic rotifers (*Keratella cochlearis* (Gosse), *Keratella americana* Carlin, and *Brachionus angularis* Gosse) and associated life history information.** *Diss. Abstr. Int. B* 36(8): 3769; 1976.

Toxicity (lethal effects) of 2,4,5-T to limnetic rotifers was measured. Technical 2,4,5-T and six commercial herbicide formulations containing 2,4,5-T derivatives were each assayed against one or all of the species: *Brachionus angularis*, *Keratella cochlearis*, and *Keratella americana*. The 2,4,5-T derivatives were its triethylamine salt, butyl ester, isooctyl ester, and *N*-oleyl-1,3-propylene-diamine salt. These studies were undertaken to assess the short-term hazard from 2,4,5-T. All determinations were done under a continuous light regime at 20.0 ± 1.0°C. Some toxicity determinations were made with rotifers supplied with algae at controlled levels. Toxicity was estimated as herbicide concentrations in mg/l corresponding to median mortality at standard intervals of 12, 24, 48, 72, and, in some cases, 92 hr. Nearly all of the toxic effects of the levels of herbicides giving determinations for 12 and 24 hrs were expressed by 48 hr. Toxicity was not directly related to content of 2,4,5-T and other ingredients of the commercial formulations had a toxic effect. Algae given as food influenced toxicity of a triethylamine salt formulation to *Brachionus angularis*. At a lower lower amount it was reduced. Median lethal concentrations for 48 hr ranged from over 100 mg/l for a triethylamine salt formulation to 0.11 mg/l for one containing the *N*-oleyl-1,3-propylene-diamine salt. The species did not display much difference in sensitivity to 2,4,5-T. The sensitivity was rather similar to that reported for fish. Bioassay in the intended receiving waters before use of the more toxic 2,4,5-T forms is recommended as it has been for fish. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 76-1989).

76-1218. Hsu, J. M. C. (Clemson Univ., Clemson, SC). **Microbial degradation of a family of herbicides, 3,5-dihalogeno-4-hydroxybenzonitriles.** *Diss. Abstr. Int. B* 36(8): 3780; 1976.

Degradation of the 3,5-dihalogeno-4-hydroxybenzonitriles, a herbicide group including ioxynil and bromoxynil, was studied. Complete degradation of ioxynil to CO_2 occurred in a clay loam, high organic matter soil. The majority of radioactivity was recovered as $^{14}CO_2$ from both ring-labeled and cyano-labeled ^{14}C-ioxynil. However, $^{14}CO_2$ was always released from cyano-labeled ioxynil at a much faster initial rate. The degradation was of microbial origin. Many microorganisms isolated from a soil enrichment could degrade ioxynil to several products. Only a fungal isolate, *Fusarium solani*, and a Gram negative bacterium, *Klebsiella ozaenae*, released CO_2 from the phenyl ring of ioxynil. A sizable fraction of radioactivity was in the form of polar products. Each of the pure cultures of ioxynil degraders degraded ioxynil to the same nonpolar products; thus the initial degradation pathway was apparently constant. Two of the degradation products from the *Fusarium solani* culture were identified as 3,5-diiodo-4-hydroxybenzamide and 3,5-diiodo-4-hydroxybenzoic acid. A modified spectrophotometric method was developed to estimate ioxynil and bromoxynil residues. The degradation half-life was estimated as 7 days for bromoxynil and 9 to 10 days for ioxynil. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-4200.)

76-1219. Mailman, R. B.; Kulharni, A. P.; Baker, R. C.; Hodgson, E. (Dep.Entomol.,North Carolina State Univ., Raleigh, NC 27607). **Cytochrome P-450 difference spectra: effect of chemical structure on type II spectra in mouse hepatic microsomes.** *Drug Metab. Disposition* 2(3): 301-308; 1974. (43 references)

A comprehensive study of the relationship between chemical structure and binding was made using hepatic microsomes from inbred male mice. Cytochrome P-450 difference spectra were determined spectrophotometrically for piperonyl butoxide, amitrole, and about 100 other compounds. With substituted pyridines, methyl, carboxyl, or *N*-oxide substituents on carbons 2 and 6 tended to inhibit or abolish spectral binding, whereas substitutions at carbon 3(5) or 4 had no such effect. A similar pattern, relative to steric hindrance, was observed with the nonaromatic cyclic amines. Conformation changes appeared to effect the differences in binding observed with indole and indoline and with pyrrole and 3-pyrroline (e.g., indoline gave a strong type II spectrum, whereas indole gave a type I spectrum). With the *N*-methyl amides, the smaller substitutions gave type II spectra, and as the size of the acyl moiety increased above that of the acetamide, binding was diminished. The monoalkylamines gave distinct type II spectra, but as steric access to the nitrogen was hindered, type II binding was abolished or hindered. The results with various nitriles, phenols, thiocyanates, and phenyl isothiocyanate suggested the importance of the electronic state of the nitrogen for the ability of the compound to cause a type II spectral shift. It is likely that the criteria established for the nitrogen-containing compounds may also apply to other nucleophilic atoms.

76-1220. Kulkarni, A. P.; Mailman, R. B.; Baker, R. C.; Hodgson, E. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Cytochrome P-450 difference spectra: type II interactions in insecticide-resistant and -susceptible houseflies.** *Drug Metab. Disposition* 2(3): 309-320; 1974. (48 references)

Microsomes were prepared from the freshly-cut abdomens of 6-day-old female houseflies of insecticide-resistant and -susceptible strains, and their difference spectra were recorded spectrophotometrically. The relationship between these spectra and the chemical structures of the microsomes was examined for piperonyl butoxide, amitrole, and more than 100 other compounds. The presence of a "sterically accessible" nitrogen atom with a pair of nonbonded electrons or an accessible oxygen atom in certain configurations appeared to be of primary importance in the formation of type II difference spectra. However, factors such as steric hindrance and electronic configuration determined the spectral magnitude. The absorption maxima and minima varied with the ligand and the source of cytochrome P-450. Although the responses of the susceptible (S) and resistant (R) microsomes to various ligands were generally similar, spectral magnitudes relative to the CO spectrum were always smaller in the S-microsomes, and the spectral shift associated with type I binding was absent from S-microsomes but present in R-microsomes. Furthermore, compounds which caused type I spectra or a mixture of type I and II spectra with R-microsomes, caused either a type II or no detectable spectrum with S-microsomes, and the spectral maxima and minima, if not identical, were always at a shorter wavelength in the R-microsomes than in the S-microsomes.

76-1221. Hodgson, E.; Philpot, R. M. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Interaction of methylenedioxyphenyl (1,3-benzodioxole) compounds with enzymes and their effects on mammals.** *Drug Metab. Rev.* 3(2): 231-301; 1974. (289 references)

The interaction of methylenedioxyphenyl (MDP) compounds with microsomal enzymes and their in vivo effects on mammals are reviewed. Compounds of this group are used as insecticide synergists. The MDP compounds are highly reactive in biological systems, interacting with a variety of enzyme systems and functioning as both enzyme inhibitors and inducers. The interaction of these compounds with cytochrome P-450 has been demonstrated in a number of species, and the effect of this interaction, inhibition of mixed-function oxidase activity, has been demonstrated in many more. This reaction is not competitive, involving instead the formation of a stable

complex. It is apparent that when acting alone, MDP compounds present little toxic hazard, and adverse chronic effects also appear to require high dosages. The greatest potential hazard presented by the MDP compounds is in their in vivo interaction with other xenobiotics. MDP compounds are widespread in nature and occur in a number of human foodstuffs. The principal commercial MDP compound piperonyl butoxide is quite stable, although other compounds, such as piperonal, are less stable. It is concluded that the hazards presented by these compounds appear at the present time to be potential, rather than proven, but they cannot be ignored.

76-1222. Tobgy, A. H.; Nasrat, G.; Nafei, H. A.; Zein El-Abidin, A. (Dep. Genet., Fac. Agric., Cairo Univ., Giza, Egypt). **Genetic study of resistance to parathion in *Drosophila melanogaster*.** *Egypt. J. Genet. Cytol.* 2(2): 375; 1973.

Drosophila melanogaster strains were used to study the genetic basis of resistance to parathion and its relation to the activities of cholinesterase and aliesterase. Five strains were under selection pressure for ten generations to test and augment their levels of resistance to parathion. The remaining three strains were susceptible strains which were put under parathion selection pressure for a number of generations. The LC50 values were estimated for each generation in all strains. Of the five strains, three maintained a high level of resistance and one maintained a moderate level. The fourth strain did not respond to selection. The fifth responded to selection and maintained a moderate level of resistance for the last three generations. One of the three susceptible strains responded to selection to the ninth generation and maintained a high level of resistance for the last four generations. The other two susceptible strains did not respond to selection. The activities of the two enzymes were estimated in the initial and last generations of each strain. While there was a positive correlation between the LC50 and cholinesterase activity, there was no such correlation between the LC50 and aliesterase activity nor between the two enzyme activities in all eight strains.

76-1223. Tobgy, A. H.; Nasrat, G.; Nafei, H. A.; Zein El-Abidin, A. (Dep. Genet., Fac. Agric., Cairo Univ. Giza, Egypt). **Genetic basis of resistance to parathion in *Drosophila melanogaster* with special reference to its biochemical nature.** *Egypt. J. Genet. Cytol.* 2(2): 375-376; 1973.

Studies were performed of reciprocal crosses and back-crosses between a susceptible multichromosomal mutant strain and three resistant strains from different geographical locations. The findings indicated that the 3 variables, LC50 and the cholinesterase and aliesterase activities, have the same genetic basis. This suggests that both enzymes are responsible for the resistance to parathion found in *D. melanogaster*. As existence of a normal cholinesterase activity level has a very important function in the nervous system of flies, the excess of cholinesterase activity in the resistant flies may be connected with the presence of the parathion. However, in the resistant flies, the low activity of aliesterase is probably due to its conversion to a phosphatase, which may be important in breaking down the organophosphorus compound. This phosphatase may encourage the flies to release greater amounts of cholinesterase in their nervous system. It is noted that the role of the two enzymes is not mutually exclusive.

76-1224. Mahmoud, S. A. Z.; Taha, S. M.; Abdel-Hafez, A. M.; Hamed, A. S. (Fac. Agric., Ain Shams Univ., Cairo, Egypt). **Effect of some pesticides on rhizosphere microflora of cotton plants. I. Insecticides and fungicides.** *Egypt. J. Microbiol.* 7(1-2): 39-52; 1972. (46 references)

The effects of some pesticides commonly used in Egypt were studied on the rhizosphere microflora of cotton plants. The insecticide disyston (disulfoton), an organophosphorus compound, was applied at the rate of 0.5, 1, and 2 g active ingredient per 100 g seed representing 1, 2, and 4 normal field application rates. The fungicide, orthocide, from the captan group, was applied at rates of 0.5, 1, and 2 g active ingredient/100 g seed representing 1, 2, and 4 normal field application rates. Both toxicants were applied as seed dressing with addition of methylcellulose as sticker. Disyston in general had an adverse effect on the densities of total microbial flora, Actinomycetes, nitrifying bacteria, and anaerobic nitrogen fixers. This adverse condition increased with the increase in concentration. The organisms returned to their normal levels after periods of time which varied for the particular organism. Counts of aerobic nitrogen fixers showed densities elevated above control in the presence of low concentrations while higher levels of the toxicants showed slight inhibition which lasted for some time. Orthocide considerably inhibited the counts of total microbial flora, nitrifying bacteria, and aerobic and anerobic nitrogen fixers. This inhibition was more pronounced than with disyston. Nitrifying bacteria and aerobic nitrogen fixers did not regain their normal levels at the end of the experimental period. Actinomycetes showed higher counts than controls, which may be due to formation of conidia and spores to evade the adverse condition of the toxicant.

76-1225. Taha, S. M.; Mahmoud, S. A. Z.; Abdel Hafez, A. M.; Hamed, A. S. (Fac. Agric., Ain Shams Univ., Cairo, Egypt). **Effect of some pesticides on rhizosphere microflora of cotton plants. II. Herbicides.** *Egypt. J. Microbiol.* 7(1/2): 53-61; 1972. (27 references)

The effects of the herbicide, CIPC (chlorpropham), were studied on the rhizosphere microflora of cotton. The experiment was conducted using fertile clay loamy soil. CIPC 50% active ingredient was applied at the rate of 7.25 liter/feddan, which represented the normal field application rate, by atomizer as a preemergence treatment to each pot of cotton seeds. The seeds were cultivated at different

periods after application, 0, 10, 20, and 30 days. The plants were examined for a period of 65 days, after which the herbicide is supposed to disappear from the root region. In general the density of the total microbial flora and of anaerobic and aerobic nitrogen fixing organisms in the rhizosphere of cotton plants cultivated directly after herbicide application was not affected soon after treatment. At one week after plant emergence, the inhibitory effect was noted. Thus it is suggested that byproducts released during the degradation of the toxicant were more toxic than the original compound. Within 20-30 days of application, the inhibitory effects of CIPC disappeared, suggesting complete degradation of toxic byproducts. Microorganisms in the rhizosphere of plants cultivated 20 and 30 days after application were not affected by the treatment. Nitrifying bacteria showed stimulatory effects in the presence of the CIPC and its byproducts. The effect of CIPC on the density of actinomycetes is somewhat different from that of other microflora. This may be attributed to less sensitivity of actinomycetes to the toxic byproducts of CIPC.

76-1226. Javaid, M. Y.; Jalil, R. (Dep. Zool., Univ. Panjab, New Campus, Lahore, Pakistan). **Effect of sublethal doses of chlorinated hydrocarbon insecticides on the heart of the tortoise, *Lissemys punctata*.** *Pak. J. Sci. Res.* 24(1-2): 148-154; 1972. (32 references)

Tortoises (*Lissemys punctata*) were treated with DDT, dieldrin, and BHC, injected into the body cavity. The heart rate and heart cycle were determined before pesticide administration at the acclimatization temperature (13.3°C), and after pesticide administration at 13.3, 17.5, and 22.3°C. In animals treated with DDT at 0-10 mg/kg, the heart rate was decreased at 13.3°C. A similar effect was noted at 17.5°C, but in this case the heart rate increased progressively with increasing pesticide dosage. In DDT-treated tortoises, the heart cycle became arrhythmic, the amplitude of the individual heart beats decreased, and the heart gave extrasystoles. Dieldrin also lowered the heart rate, in proportion to the dosage. The abnormalities in heart cycle noted with DDT were also noted with dieldrin and with BHC. The heart rate was affected by BHC in the same manner as by dieldrin. Dieldrin produced the greatest changes in the heart function of the tortoise, followed by DDT and BHC.

76-1227. Guirguis, G. N.; Brindley, W. A. (Dep. Biol., Utah State Agric. Exp. Stn., Utah State Univ., Logan, UT 84322). **Insecticide susceptibility and response to selected pollens of larval alfalfa leafcutting bees, *Megachile pacifica* (Panzer) (Hymenoptera: megachilidae).** *Environ. Entomol.* 3(4): 691-695; 1974. (7 references)

A method for rearing larvae from field-collected eggs of *Megachile pacifica* (Panzer) was used to measure insecticide toxicities, synergist ratios, and larval growth on 4 pollen species. Carbaryl, propoxur, Landrin (3,4,5-trimethylphenyl methylcarbamate and 2,3,5-trimethylphenyl carbamate),and methomyl had LC50 values ranging from 42-121 ppm. Gardona (2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate, tetrachlorvinphos) and monocrotophos were more toxic, with LC50 values of about 1.7 and 2.6 ppm, respectively. The carbaryl-piperonyl butoxide synergist ratios for the larvae were estimated to range between 1.57 and 2.17. Alfalfa pollen provided the best larval growth. Pollens from goatsrue, sweet clover, and goldenweed were less satisfactory. (Author abstract by permission)

76-1228. Villeneuve, D. C.; Panopio, L. G.; Grant, D. L. (Fd. Res. Lab., Health Protect. Branch, Tunney's Pasture, Ottawa, Ontario, Canada). **Placental transfer of hexachlorobenzene in the rabbit.** *Environ. Physiol. Biochem.* 4(3): 112-115; 1974. (8 references)

White female New Zealand rabbits were mated (day 0) then given HCB (0, 0.1, 1.0, or 10 mg/kg) orally on days 1-27. On day 28, the dams were killed, the fetuses excised, and the maternal and placental tissues removed. The HCB content of the maternal and fetal tissue was determined by gas-liquid chromatography. HCB crossed the placenta and accumulated in the fetus in a dose-dependent manner. In the dams, the tissue with the highest HCB concentration was the fat, followed in decreasing order by the liver, heart, kidney, brain, lung, spleen, and plasma. In the fetus, the liver concentrations were higher than in the corresponding maternal organ and comprised 70-80% of the fetal body burden. No fetotoxic effects were observed at any of the dose levels studied.

76-1229. Dikshith, T. S. S.; Behari, J. R.; Datta, K. K.; Mathur, A. K. (Ind. Toxicol. Res. Cent., Lucknow, India). **Effect of diazinon on male rats. Histopathological and biochemical studies.** *Environ. Physiol. Biochem.* 5(5): 293-299; 1975. (12 references)

Sixteen male albino ITRC rats were divided into two groups, one of which was treated with a single i.p. dose of diazinon (21.6 mg/kg) in peanut oil. After 10 days, the liver, kidneys, and testes were examined histopathologically and biochemically. None of the animals showed signs of morbidity or mortality, and none of the organs showed signs of gross abnormality. The levels of succinic dehydrogenase (SDH) and ATPase increased significantly and the level of alkaline phosphatase decreased slightly in the livers of the diazinon-treated rats. Microscopic examination of the affected organs showed feathery degeneration and pyknotic nuclei in some of the hepatocytes. The activity of all three enzymes decreased only slightly in the testes, but there were marked histopathological changes, including reductions in tubule size, necrosis, and edema. The activities of ADH and alkaline phosphatase in the kidneys remained practically unaltered after diazinon administration, but that of ATPase showed a significant increase. There were no histopathological changes observed in this organ.

76-1230. Villeneuve, D. C.; Khera, K. S. (Fd. Directorate, Health Protect. Branch, Ottawa, Ontario, Canada). **Placental transfer of halogenated benzenes (pentachloro-, pentachloronitro-, and hexabromo-) in rats.** *Environ. Physiol. Biochem.* 5(5): 328-331; 1975. (5 references)

Pentachloro-, pentachloronitro-, and hexabromobenzene were administered per o s to rats daily on days 6 through 15 of gestation at a level of 40, 100, or 200 mg/kg body weight. On day 22, the dams were killed and the fetuses removed. Maternal brain, heart, kidney, liver, spleen, and adipose tissue as well as whole fetus, fetal liver, and fetal brain were analyzed by gas-liquid chromatography for organohalogen residues. Pentachlorobenzene accumulated in the fetus to a greater extent than hexabromobenzene. In the maternal tissues, pentachlorobenzene accumulated to the greatest extent in the adipose tissue, followed by the liver, spleen, brain; heart, and kidney. With hexabromobenzene, the greatest accumulation was also observed in the adipose tissue, followed by the spleen, liver, heart, kidney, and brain. Pentachloronitrobenzene was not detected (0.05 ppm) in any maternal or fetal tissue. The only significant teratological findings (incidence of fourteenth rib, sternal defects, and presence of 15 ribs) occurred in the animals receiving pentachlorobenzene.

76-1231. Iatropoulos, M. J.; Milling, A.; Mueller, W. F.; Nohynek, G.; Rozman, K.; Coulston, F.; Korte, F. (Int. Cent. Environ. Safety, Albany Med. Coll., Holloman Air Force Base, NM). **Absorption, transport and organotropism of dichlorobiphenyl (DCB), dieldrin, and hexachlorobenzene (HCB) in rats.** *Environ. Res.* 10(3): 384-389; 1975. (2 references)

Sprague-Dawley rats were given a single dose of 150 μg of ^{14}C-labeled DCB, dieldrin, or HCB by stomach tube. At 1, 3, 5, 12, and 48 hour following dosing, one male and one female were killed. Samples of each organ or tissue were combusted and the $^{14}CO_2$ content determined and the results averaged and recorded. DCB was rapidly absorbed from the gastrointestinal tract and transported to the liver mainly via the portal venous system, metabolized rapidly by the liver and excreted without significant storage. Dieldrin was similarly absorbed and transported to the liver; however, only a portion was metabolized and excreted, with redistribution and subsequent storage of most dieldrin in the adipose tissue. HCB was more slowly absorbed with minor involvement of the portal venous system, and major absorption by the lymphatic system with subsequent deposition in the fat. (Author abstract by permission of Academic Press)

76-1232. Myatt, G. L.; Ecobichon, D. J.; Greenhalgh, R. (Dep. Pharmacol., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Fenitrooxon and *S*-methyl fenitrothion: acute toxicity and hydrolysis in mammals.** *Environ. Res.* 10(3): 407-414; 1975. (17 references)

A comparison of the toxicity, chemical stability, and biotransformation of fenitrooxon and *S*-methylfenitrothion revealed marked differences between these structurally similar organophosphorus esters. While the potency of the two esters was comparable when incubated for short intervals with mammalian plasma pseudocholinesterase, the acute (i.p.) LD50 values in the male mouse were 112 mg/kg for *S*-methyl fenitrothion, and 44.5 mg/kg for fenitrooxon. *S*-Methyl fenitrothion was chemically less stable at pH 7.4 than was fenitrooxon and was extremely susceptible to enzymatic hydrolysis by plasma and hepatic arylesterase of the rat, rabbit, and guinea pig: the rates being seven- to 20-fold higher than those observed for fenitrooxon. (Author abstract by permission of Academic Press)

76-1233. Boyadjiev, S. (Med. Fac. I.P. Pavlov, Plovdiv, Bulgaria). **Changes in cholinesterase activity in white rats, after several injections of TMB-4 and atropine, following treatment with parathion.** *Folia Med. (Plovdiv)* 16(5-6): 281-285; 1974. (23 references)

Male rats were injected s.c. with 10 mg/kg technical parathion, and atropine and/or TMB-4 was given several min later or immediately, 6 hr, and 24 hr later. In animals given parathion but not atropine or TMB-4, the plasma cholinesterase was inhibited 65% after 1 hr and 92% after 20 hr, and the erythrocyte cholinesterase was inhibited 43% and 94% after the same intervals. Brain cholinesterase was inhibited only 10% after 1 hr and 71% after 20 hr. TMB-4 increased the plasma, erythrocytic, and brain cholinesterase activities after parathion inhibition in a dose-dependent fashion. The effect of TMB-4 was greatest on the erythrocytic enzyme, and least on the brain enzyme. Atropine plus TMB-4 was more effective than TMB-4 alone in reversing the parathion-induced inhibition of the plasma cholinesterase, but less effective than TMB-4 alone in reversing the effects on the erythrocytic and brain enzymes. The effects of the atropine-TMB-4 combination were greater when the mixture was given three times after parathion administration than when it was given only once.

76-1234. Sterrett, R. B.; Fretz, T. A. (Ohio Agric. Res. Develop. Cent., Wooster, OH). **Asulam-induced mitotic irregularities in onion root-tips.** *HortScience* 10(2): 161-162; 1975. (7 references)

The influence of duration of exposure and concentration of asulam was studied on the mitotic root-tip cells of the onion. Asulam was used in concentrations of 0.0, 0.8, 2.4, and 9.6 μM. Seeds were removed from solution after 7, 31, and 55 hr and fixed in Farmer's solution (2 parts absolute alcohol: 1 part glacial acetic acid). Asulam caused an increase in the frequency of cells in metaphase and a concomitant decrease in prophase and anaphase-telophase. The dividing cells of the control root-tips showed normal divisions and no aberrations. At 7 hr of exposure, no statistically significant differences were

noted between controls and any of the three seeds exposed to concentrations of asulam in terms of the percentage of mitotic figures in prophase, metaphase, or anaphase-telophase. However, the percentage of metaphase figures increased at the 2.4 and 9.6 μM concentrations as time following treatment increased, with a concomitant decrease in prophase and anaphase-telophase figures. An increased frequency of aberrations was noted at all concentrations of asulam over 31 and 55 hr. These aberrations included occasional anaphase bridges, possible mitotic crossovers, or chromosome stickiness, and c-mitoses. Thus, at an optimum time and concentration the herbicide asulam arrests metaphase in root-tip cells of germinating onion. Numerous cytological aberrations were also noted.

76-1235. Makhija, S. J.; Pawar, S. S. (Div. Biochem., Dep. Chem., Marathwada Univ., Aurangabad, India). **Hepatic drug metabolizing enzymes and lipid peroxidation in young growing male rats during treatment with an organophosphorus insecticide Take-20 (*O,O*-dimethyl malathion).** *Indian J. Med. Res.* 63(10): 1402-1407; 1975. (24 references)

Biochemical studies were conducted to obtain toxicological data on the effects of Take-20 (*O,O*-dimethyl malathion) on C.F. strain young male white rats. The animals were injected i.p. with various doses of the insecticide: 100, 150, 200, 300, and 400 mg/kg in corn oil per day for 2 days. When the animals were treated with low to medium doses, the liver weights, relative liver weights, and drug metabolizing enzymes were increased. However, the liver protein content was decreased. Dose levels of 300 and 400 mg/kg resulted in decreased liver weights, relative liver weights and drug metabolizing enzyme levels. However, the liver protein content was increased, indicating that the protein synthesis and enzyme activities were behaving in an entirely different manner. Enzymatic and non-enzymatic lipid peroxidations were decreased with low and medium doses and increased with high doses. The animals could thus no longer adapt to the toxic effects.

76-1236. Vos, J. G.; Moore, J. A. (Environ. Biol. Chem. Branch, Natl. Inst. Environ. Health Sci., Research Triangle Park, NC). **Suppression of cellular immunity in rats and mice by maternal treatment with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Int. Arch. Allergy Appl. Immunol.* 47(5): 777-794; 1974. (40 references)

Pregnant F-344 rats received TCDD (dioxon) at 0, 1, or 5 μg/kg on gestation days 11 and 18, and postnatally on days 4, 11, and 18. In two studies lactating adult rats received 5 μg TCDD/kg on postnatal days 0, 7, and 14. In C57B/16 mice 1 and 4 months old, doses of 1, 5, or 25 μg TCDD/kg were given. Treatment of pregnant mice and rats during the latter half of gestation and in the postnatal period caused severe depletion of lymphocytes in the thymic cortex of the offspring. Cellular immunity was impaired. Allograft rejection times were prolonged in rats and mice. Graft-vs.-host activity of spleen cells and the response of rat thymus and spleen cells to phytohemagglutinin was reduced on a cell-for-cell basis. There was no reduction in the response of thymus cells to concanavalin A. Postnatal maternal treatment reduced total phytohemagglutinin and concanavalin A response recoverable from the thymus by 91 and 74%, respectively. Depletion of thymic cortex was not due to lymphocyte destruction. There was no adrenal hypertrophy. Stress-induced release of glucocorticoids is not considered responsible for the immune suppression which occurred. In mice treated at 1 month of age, reduced responsiveness of spleen cells to PHA was noted only at a dose level that was clearly toxic. In 4 month old mice, PHA responsiveness and graft-vs.-host activity were not decreased. The response of unstimulated and stimulated thymus and spleen cell cultures was not reduced by adding TCDD in vitro. In treated rats, decreased eosinophilia was noted in acidophilic cells in the adenohypophysis. Suppression of the cell-mediated immune response in rats and mice appears to be an age-related phenomenon. TCDD exposure during ontogenesis of the immune system seems to be prerequisite.

76-1237. Hendrickson, C. M.; Bowden, J. A. * (Dep. Biochem., Louisiana State Univ., Baton Rouge, LA 70803). **In vitro inhibition of lactate dehydrogenase by insecticidal polychlorinated hydrocarbons. I. Mechanism of inhibition; possible association of reduced nicotinamide adenine dinucleotide with mirex.** *J. Agric. Food Chem.* 24(2): 241-244; 1976. (21 references)

In order to aid in the clarification of the inhibitory mechanism operating in vitro on NADH-dependent dehydrogenases, the effect of dodecachlorooctahydro-1,3,4-metheno-2*H*-cyclobuta-[*cd*]pentalene (Mirex) was determined on the activity of crystalline rabbit muscle lactate dehydrogenase (EC 1.1.1.27, M_4 isozyme) at 340 nm. Mirex competitively inhibited with respect to both pyruvate and NADH (*Ki* values are 0.02 and 0.03 mM, respectively). A time-dependent association of Mirex with NADH was also observed as were changes in both UV and CD spectra. Based on the mechanism of lactate dehydrogenase a mechanism was postulated for in vitro inhibition. This mechanism involves formation of a weak association complex between Mirex and NADPH, and possibly some binding of Mirex with the enzyme molecule itself subsequent to formation of the Mirex-NADPH-enzyme complex. The probable nature of the complex and implications of these findings are discussed. (Author abstract reprinted by permission of the American Chemical Society)

76-1238. Rip, J. W.; Cherry, J. H. * (Dep. Hortic., Purdue Univ., West Lafayette, IN 47907). **Liver enlargement induced by the herbicide 2,4,5-trichlorophenoxyacetic acid (2,4,5-T).** *J. Agric. Food Chem.* 24(2): 245-250; 1976. (24 references)

Feeding of the herbicide 2,4,5-T causes the liver to enlarge while the weight of other organs (kidney, spleen) and the weight of the intact young rat are unaffected. Increases in relative liver fresh weight (and dry weight) were dose dependent and could be observed after feeding 2,4,5-T at 10 mg/day per animal for 1-2 days (total intake 167-334 mg/kg). Enlargement was associated with substantial increases in total RNA and total protein per liver. These increases were not restricted to any particular subcellular fraction, but appear to represent a general induction of RNA and protein and protein synthesis. Total DNA content per liver was not affected by the herbicide while the DNA and RNA content per gram of fresh liver was reduced. The enlargement response was reversible on the removal of the herbicide from the diet and appears not to be directed toward the synthesis of 2,4,5-T metabolizing enzyme activities. The activity in 2,4,5-T fed rats of enzymes sensitive to known hepatotoxins suggests that 2,4,5-T does not have a strong hepatotoxic activity. The herbicide demonstrates activity similar to the structurally related drug chlorophenoxyisobutyrate (CPIB) which like 2,4,5-T induces liver enlargement and stimulates hepatic RNA and protein synthesis while inducing extensive self-metabolism. (Author abstract reprinted by permission of the American Chemical Society)

76-1239. Bullard, R. W.; Thompson, R. D.; Holguin, G. (U. S. Fish Wildl. Serv., Res. Cent., Fed. Cent., Denver, CO 80225). **Diphenadione residues in tissues of cattle.** *J. Agric. Food Chem.* 24(2): 261-263; 1976. (7 references)

Blood and tissue of cattle were tested for residues of diphenadione (2-(diphenylacetyl)-1,3-indandione), an anticoagulant livestock systemic intended for use in vampire bat (*Desmodus rotundus*) control. Liver and kidney samples from heifers given single 1 mg/kg intraruminal injections contained 0.15 ppm or less up to 90 days posttreatment. Detectable levels (> 0.01 ppm) could not be found by gas-liquid chromatography in blood, brain, heart, fat, and muscle tissue samples taken at 30, 60, and 90 days posttreatment. Adult Sprague Dawley rats were fed the liver from test cattle in a 14-day secondary hazard feeding study. No rats died, treated and control rats did not differ in prothrombin clotting time, and diphenadione was not detected in the liver or blood of treated rats. Calculations based on residue levels in this study indicate that humans may safely eat the meat, including liver and kidney, of treated cattle. (Author abstract reprinted by permission of the American Chemical Society)

76-1240. Elliott, M.; Janes, N. F.; Pulman, D. A.; Gaughan, L. C.; Unai, T.; Casida, J. E. (Dep. Insecticides and Fungicides, Rothamsted Exp. Stn., Harpenden, Herts., England). **Radiosynthesis and metabolism in fats of the 1*R* isomers of the insecticide permethrin.** *J. Agric. Food Chem.* 24(2): 270-276; 1976. (27 references)

Permethrin [3-phenoxybenzyl (±)-*cis,trans*-3-(2,2-dichlorovinyl)- 2,2-dimethyl cyclopropane carboxylate] is more stable in air and light than previous pyrethroids, and therefore has a greater potential for controlling a wide range of insect pests. Metabolism of the [1*R,trans*]- and [1*R,cis*]-esters, the active isomers of permethrin, following oral administration to rats at about 1 mg/kg, was examined using compounds labeled with ^{14}C in the acid or alcohol moieties. These were synthesized either from [1*R,trans*]- or [1*R,cis*]-acid labeled in the side chain [$Cl_2{}^{14}C$-CH-] or from alcohol labeled at α-CH_2 or in the phenoxy substituent. The [1*R,trans*]- and [1*R,cis*]-esters are readily metabolized by ester cleavage, by hydroxylation of the geminal dimethyl group in the acid or the phenoxy group of the alcohol, and by conjugation of the resulting carboxylic acids and phenols. The metabolites are quickly excreted and do not persist significantly in tissues. (Author abstract reprinted by permission of the American Chemical Society)

76-1241. Khalifa, S.; Holmstead, R. L.; Casida, J. E. * (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Toxaphene degradation by iron(II) protoporphyrin systems.** *J. Agric. Food Chem.* 24(2): 277-282; 1976. (16 references)

Toxaphene reacts with reduced hematin in neutral aqueous medium to cleave about half of the C—Cl bonds, yielding derivatives of shorter retention times on gas chromatography and of reduced sensitivity for detection by electron capture. This system converts toxicants A and B, two of its most toxic components, to products formed by reductive dechlorination, dehydrochlorination, and a combination of these reactions. Extensive metabolism of toxaphene and toxicants A and B by rat liver microsomes requires both NADPH and anaerobic conditions, thereby suggesting that reduced cytochrome P-450 acts as the reducing agent. These iron(UI) protoporphyrin systems may serve as models for understanding how toxaphene degradation proceeds under certain metabolic and environment conditions. (Author abstract reprinted by permission of the American Chemical Society)

76-1242. Smith, A. E.; Phillips, D. V. (Dep. Agron. Plant Pathol., Univ. Georgia, Coll. Agric. Exp. Stn., Georgia Stn., Experiment, GA 30212). **Degradation of 4-(2,4-dichlorophenoxy)butyric acid (2,4-DB) by *Phytophthora megasperma*.** *J. Agric. Food Chem.* 24(2): 294-296; 1976. (11 references)

Research was carried out to investigate the efficacy of *Phytophthora megasperma* var. *sojae* in metabolizing (β-oxidizing) 2,4-DB [4-(2,4-dichlorophenoxy) butyric acid] releasing 2,4-D [(2,4-dichlorophenoxy)acetic acid]. Results indicate that the cultured fungus degraded ca. 45% of the 2,4-DB included in the treatments over a 21-day assay period. However, 2,4-D was not detected in the nutrient medium or fungus mycelium throughout the experimental period. In similar experiments using 2,4-D, this fungus was found incapable of degrading 2,4-D. This data suggests that the initial step in 2,4-DB metabolism by *P.*

megasperma does not include β-oxidation of 2,4-DB. Additionally, 3-5 times more 2,4-DB than 2,4-D was absorbed and accumulated by this fungus. (Author abstract reprinted by permission of the American Chemical Society)

76-1243. Schulz, K. R.; Fuhremann, T. W.; Lichtenstein, E. P.* (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706). **Interaction of pesticide chemicals. Effect of Eptam and its antidote on the uptake and metabolism of [^{14}C]phorate in corn plants.** *J. Agric. Food Chem.* 24(2): 296-299; 1976. (14 references)

The effects of soil treatments with the herbicide Eptam (EPTC) and its corn antidote (Stauffer, R-25788) were investigated on the translocation and metabolism of [^{14}C]phorate in corn seedlings. While at concentrations of 5 ppm of Eptam in a [^{14}C]phorate treated (2 ppm) Plainfield sand no visible damage to the growing corn plants was noticeable, the amounts of ^{14}C compounds in corn greens from herbicide-treated soil were significantly increased by a factor of 1.8. In particular, the amount of unextractable ^{14}C-labeled residues was higher in plants grown in [^{14}C]phorate plus Eptam-treated soil. After 18 days soils contained phorate, phorate sulfoxide, and phorate sulfone, while in greens only the metabolites phorate sulfoxide, phorate sulfone, and phoratoxon sulfoxide could be detected. Due to the presence of Eptam in the [^{14}C]phorate-treated soil, the amounts of both phorate sulfoxide and phorate sulfone were significantly increased by a factor of 1.6 and those of phoratoxon sulfoxide by a factor of 2.4. Addition of the antidote (at 1 ppm) to [^{14}C]phorate treated soil had no effect on the translocation and metabolism of insecticide in corn greens, yet counteracted the effects of Eptam. Thus, analyses of corn greens grown in [^{14}C]phorate-treated soil containing also Eptam and its antidote gave results similar to those grown in soil which had only been treated with [^{14}C]phorate. These findings further point to the problem of potential interactions of environmental chemicals in biological systems. (Author abstract reprinted by permission of the American Chemical Society)

76-1244. Nye, D. E.; Hurst, H. E.; Dorough, H. W.* (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Fate of croneton (2-ethylthiomethylphenyl *N*-methylcarbamate) in rats.** *J. Agric. Food Chem.* 24(2): 371-377; 1976. (6 references)

The fate of Croneton, 2-ethylthiomethylphenyl *N*-methylcarbamate, was determined in rats following single oral or dietary exposure to the ^{14}C-carbonyl- and ^{14}C-ring-labeled insecticide. Greater than 95% of the [^{14}C]Croneton equivalents was excreted in the urine or as a combination of $^{14}CO_2$ (47%) and urinary products (41%) 72 h after a single oral dose. The feces contained 2—7% of the dose. A similar excretion pattern was observed during a 7-day feeding period. The principal urinary metabolites were Croneton sulfoxide (23-28% of the dose), phenol sulfoxide (20-23%), phenol sulfone (9-25%), and Croneton sulfone (3-11%) after a single oral dose and similar in the long term study. The carbamates were excreted primarily as free metabolites while the phenolic constituents were eliminated as acid labile conjugates. The 24-hr acute oral LD50 values of Croneton, Croneton sulfoxide, and Croneton sulfone to mice were 71, 59, and 282 mg/kg, respectively. (Author abstract reprinted by permission of the American Chemical Society)

76-1245. Lavee, S.; Martin, G. C. (Dep. Pomol., Univ. California, Davis, CA). **Ethephon (1,2-^{14}C(2-chloroethyl) phosphonic acid) in peach fruits.** *J. Amer. Soc. Hort. Sci.* 99(2): 100-103; 1974. (12 references)

The acid methanol extract from the exocarp of 1,2-^{14}C(2-chloroethyl) phosphonic acid (^{14}C-CEPA)-treated peach fruits contained four radioactive substances in addition to ^{14}C-CEPA, and three such substances were found in the petroleum ether extract. The total radioactivity of three substances, compared to that of ^{14}C-CEPA and its inherent contaminants recovered from the peach fruit exocarp, did not exceed 3%. Neither the petroleum ether nor the acid methanol fractions contained a true metabolite of CEPA resulting from reactions involving living tissue. The newly formed radioactive compounds were quite stable and similar constituents were found in fruits of different species treated with ^{14}C-CEPA. Thus, the reaction might be associated with a wide range of CEPA-responsive plants. It is suggested that the response of fruits to CEPA may, at least in part, be attributable to an endogenous regulatory system rather than to the release of ethylene on the fruit surface.

76-1246. Martin, W. L.; Rogers, R. W.; Essig, H. W.; Pund, W. A. (Mississippi State Univ., Mississippi State, MS 39762). **DDT analog depletion patterns in steers.** *J. Anim. Sci.* 42(1): 196-200; 1976. (19 references)

The depletion of DDT, DDE (TDE), and DDE in the fat of eight steers that had been fed DDT- and DDE-contaminated (3.27-18.83 ppm total DDT) gin trash for 216 days was monitored via gas-liquid chromatographic analysis of fat biopsies. Perianal adipose tissue was obtained from each animal when it was changed to an uncontaminated finishing diet, and subsequent samples were obtained every 14 days during the following 56-day period. The mean initial total DDT level for the eight steers was 10.74 ppm on a rendered fat basis. After 14, 28, 42, and 56 days, the mean total DDT levels were 8.16, 6.41, 5.53, and 5.54 ppm, respectively. The addition of 0.5% choline chloride and/or 0.9 kg of activated charcoal to the daily feed of each animal during the finishing period did not significantly influence the rate of DDT depletion.

76-1247. Lincer, J. L. (Mote Marine Lab., 9501 Blind Pass Rd., Sarasota, FL 33581). **DDE-induced eggshell-thinning in the American kestrel: A comparison of the field situation and laboratory results.** *J. Appl. Ecol.* 12(3): 781-793; 1975. (43 references)

American kestrels were studied to elucidate the dose-response relation between dietary DDE and eggshell-thinning, and to compare these laboratory results with egg residues and eggshell-thinning found in a northeastern population of the same species. Dietary doses used in the study were: 0, 0.3, 3.0, 6.0, or 10.0 ppm, based on wet weight. DDE residues found in kestrel eggs collected from the area of Ithaca, New York averaged 35, 42, 33, and 37 ppm for the years 1969, 1970, 1971, and 1972. Eggshells of the local population averaged 10% thinner then pre-DDT eggshells, based on Ratcliffe's Index. A dose-response relation was established for dietary DDE and eggshell-thinning in a captive kestrel population. The correlation relation between DDE in the egg and eggshell-thinning is the same for both captive experimental birds and the wild bird population. In accordance with data from other studies in relation to organochlorines, eggshell-thinning, and the decline of several populations of North American raptors, it is concluded that a causal relation exists between the ingestion of prey highly contaminated with DDE and subsequent eggshell-thinning and eggshell breakage. The breeding failure which follows and the resultant decline in population preceeds in a straightforward, logical, and well-documented fashion.

76-1248. Knowles, C. O.; Schuntner, C. A. (Div. Entomol., CSIRO, Long Pocket Labs., Indooroopilly, Queensland, Australia). **Effect of piperonyl butoxide on the absorption and metabolism of chlordimeform by larvae of the cattle tick, *Boophilus microplus*.** *J. Aust. Entomol. Soc.* 13(1): 11-16; 1974. (8 references)

Cattle tick larvae (*Boophilus microplus*) continuously exposed to 0.02% *N'*-(4-chloro-*o*-tolyl) *N,N*-dimethylformamidine (chlordimeform-^{14}C) in impregnated packets absorbed the acaricide and metabolized it to *N'*-(4-chloro-*o*-tolyl)- *N*-methylformamidine (demethylchlordimeform), 4'-chloro-' *o*-formotoluidine, 4-chloro-*o*-toluidine, and an unidentified polar conjugate. Larval mortality was greatest between 24 and 48 hr of exposure, and more than 85% of the larvae were dead after 48 hr. During this interval, demethylchlordimeform, itself an acaricide, was the major metabolite. Cattle tick larvae continuously exposed to 0.02% chlordimeform-^{14}C in the presence of 0.2% piperonyl butoxide absorbed less of the acaricide, metabolized comparatively little of it, and were all still alive at 48 hr. Thus, piperonyl butoxide blocked the metabolism of chlordimeform, probably by inhibiting the mixed function oxidase system responsible for catalyzing the oxidative *N*-dealkylation to demethylchlordimeform. The data is consistent with the view that demethylchlordimeform is the lethal toxicant in chlordimeform-poisoned cattle tick larvae.

76-1249. Carsiotis, M.; Jones, R. F.; Wesseling, A. C. (Dep. Microbiol., Coll. Med., Univ. Cincinnati, Cincinnati, OH 45219). **Cross-pathway regulation: histidine-mediated control of histidine, tryptophan, and arginine biosynthetic enzymes in *Neurospora crassa*.** *J. Bacteriol.* 119(3): 893-898; 1974. (41 references)

Studies were performed to determine the effect of histidine starvation on the biosynthetic enzymes needed to synthesize that amino acid. Not only was HPtr derepressed by histidine starvation, but also two tryptophan biosynthetic enzymes, Tsase and InGPase, and two arginine biosynthetic enzymes, OTCase and CPsase, were derepressed. The synthesis of NADP-linked isocitrate dehydrogenase and the intracellular tryptophan pool were unaffected by histidine starvation. In all further experiments, one or more histidine, tryptophan, and arginine biosynthetic enzymes was measured in order to determine the extent of histidine-mediated control. The fact that histidine starvation did not affect the specific activity of aspartyl transcarbamylase, itself a pyrimidine biosynthetic enzyme derepressible by uridine starvation, or the specific activity of NADP-linked isocitrate dehydrogenase, indicates that histidine starvation does not cause derepression of all enzymes. Further studies demonstrated that histidine could reverse the growth inhibitory effect of amitrole and the derepression of tryptophan biosynthetic enzymes. The results of these experiments showed that histidine added at the time of amitrole addition prevented both growth inhibition and derepression of the two tryptophan biosynthetic enzymes measured. The reversal of growth inhibition by histidine was not due to the exclusion of amitrole by histidine.

76-1250. Moore, E. D.; Dowlen, H. H.; Owen, J. R.; Richardson, D. O. (Dairy Exp. Stn., Agric. Res. Serv., Lewisburg, TN). **Bovine hyperkeratosis of the skin from oil carriers and an insecticide on backrubbers.** *J. Dairy Sci.* 59(1): 24; 1976.

Bovine hyperkeratosis of the skin on head, neck, and top-line developed within 30 days after use of a fiber backrubber saturated with No. 2 diesel fuel mixed with "Co-Ral" (coumaphos) Emulsifiable Livestock Insecticide, ratio 13:1 . Patch tests were made on the backs of yearling heifers to compare diesel fuel, kerosene, and mineral oil as carriers at various dilutions (0, 50, and 75% water) with and without Co-Ral. All combinations of diesel and kerosene caused the hair to be stiff and raised, and the skin not pliable, after daily applications for 12 days. No more applications were made. Within 30 days of the initial treatment, the hair was dead and beginning to thin, and the skin dry, thickened, cracked, or wrinkled on several test patches. Carrier/Co-Ral combinations causing this condition (listed in order of severity) were: kerosene + Co-Ral; 50% diesel; diesel; diesel + Co-Ral; kerosene; 50% kerosene + Co-Ral; and 25% diesel + Co-Ral. Mineral oil/water/Co-Ral combinations had no ill-effect on either hair or skin. (Author abstract by permission)

76-1251. Fries, G. F.; Marrow, G. S. (U.S. Dep. Agric., Agric. Res. Serv., Agric. Environ. Qual. Inst., Beltsville, MD 20705). **Hexachlorobenzene retention and excretion by dairy cows.** *J. Dairy Sci.* 59(3): 475-480; 1976. (18 references)

Two groups of three cows each were fed either 5 or 25 mg of hexachlorobenzene (HCB) per day for 60 days. A reference compound, DDE (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene), was fed to the cows at the same rate. Residues were determined in milk at 5-day intervals during the 60-day dosing period and for 60 days after dosing was stopped. The concentration of hexachlorobenzene in milk fat increased more slowly than did that of the reference compound during feeding. The ratio of the two was 1:2 at 10 days, but approached 1:1 after 40 days of feeding. The average concentrations in milk fat for the 40th to 60th days of feeding were 9.0 and 10.4 ppm with the 25 mg/day intake and 2.1 ppm for each compound with the 5 mg/day intake. Corresponding values in subcutaneous body fat were 8.8, 8.0, 1.9, and 1.4 ppm at 60 days. Milk fat concentrations of hexachlorobenzene declined 32% and those of the reference 51% within 15 days after feeding stopped. Thereafter, the decline was slower but similar for both compounds. Biological half-lives ranged from 29 to 64 days for individual cows. The milk fat:body fat concentration ratio was 0.87:1 for hexachlorobenzene and 0.71:1 for the reference during the 60 days when cows were not fed the compounds. (Author abstract by permission)

76-1252. Drummond, R. O.; Ernst, S. E.; Trevino, J. L.; Gladney, W. J.; Graham, O. H. (U.S. Livestock Insects Lab., Agric. Res. Serv., USDA, Kerrville, TX 78028). **Tests of acaricides for control of *Boophilus annulatus* and *B. microplus*.** *J. Econ. Entomol.* 69(1): 37-40; 1976. (5 references)

In laboratory tests, 4 strains (3 from Mexico and 1 from Texas) of the southern cattle tick, *Boophilus microplus* (Canestrini), were not resistant to 9 commonly used acaricides. "Solubilized" formulations of both chlorpyrifos (2 lb/gal) and Compound 4072 (2-chloro-1-(2,4-dichlorophenyl)vinyl diethyl phosphate) (8 lb/gal) were as effective as emulsifiable formulations. Of 18 acaricides sprayed onto cattle artificially infested with *B. microplus* and with the cattle tick, *B. annulatus* (Say), 16 were applied at concentrations that afforded > 99% control of either or both species. Sprays of an 8 lb/gal and a diluent-free formulation (both solubilized) of Compound 4072 afforded > 99% control of both species at 0.02-0.025%. In dipping vat tests, a solubilized formulation (1 part AI:1 part Triton X-100) of Compound 4072, after an initial charge of 0.1%, was still effective at 126 wk postcharge (end of test) though the vat contained only 0.0051% AI. Phosmet (Imidan) in the vat at 0.25% caused poisoning in cattle but was effective for 68 wk at a concentration of 0.003% though not at 79 wk at a concentration of 0.001%. (Author abstract by permission)

76-1253. Wright, J. E.; Spates, G. E.; Schwarz, M. (Vet. Toxicol. Entomol. Res. Lab., Agric. Res. Serv., USDA, College Station, TX 77840). **Insect growth regulator AI3-36206. Biological activity against *Stomoxys calcitrans* and *Musca domestica* and its environmental stability.** *J. Econ. Entomol.* 69(1): 79-82; 1976. (5 references)

The insect growth regulator AI3-36206, (1-(8-methoxy- 4,8-dimethylnonyl)- 4- (1-methylethyl) benzene), was active against all stages of *Musca domestica* L. and *Stomoxys calcitrans* (L.). Spray tests with concentrations as low as 0.01% gave 99% inhibition of adult development on 1-m^2 surface area of larval breeding media. A method was devised for determining the concentration of AI3-36206 in breeding medium by using gas chromatography with a flame ionization detector. The results of concentrations, aging, and distribution showed that the material was stratified in the upper levels of the breeding medium and moved downward with time. Photodecomposition studies established that the half-life of AI3-36206 at 50°C was ca. 15 hr for UV and ca. 36 1/2 hr for IR irradiation. At 40°C, the half-life was ca. 36 hr for UV and exceeded 96 hr for IR. (Author abstract by permission)

76-1254. Focht, D. D.; Joseph, H. (Dep. Soil Sci. Agric. Eng., Univ. California, Riverside, CA 92502). **Microbial activity in soils treated with acephate and monitor.** *J. Environ. Qual.* 3(4): 327-328; 1974. (9 references)

A Hanford loamy sand, a Domino silt loam, and an Altamont clay loam were treated separately with three repeated applications (20 ppm) of the organophosphate insecticides, acephate (*O,S*-dimethyl acetylphosphoramidothioate) and Monitor (methamidophos) over a 50-day time span. Population levels of actinomycetes, bacteria, and fungi were not substantially affected by the addition of either pesticide. Neither could a marked effect be shown upon ammonification, nitrification, sulfur oxidation, or respiration rates. Replica plating failed to isolate bacteria from soils that were adversely affected by either pesticide. It is concluded that neither acephate nor Monitor had any adverse effect upon soil microorganisms. (Author abstract by permission)

76-1255. Bollag, J. M.; Henninger, N. M. (Dep. Agron., Pennsylvania State Univ., University Park, PA 16802). **Influence of pesticides on denitrification in soil and with an isolated bacterium.** *J. Environ. Qual.* 5(1): 15-23; 1976. (25 references)

Various pesticides were tested for their influence on the denitrification process in soil and on an isolated denitrifying bacterium. In soil the denitrifying activity was essentially inhibited by the fungicides captan (*N*-trichloromethylmercapto-4-cyclohexene- 1,2-dicarboximide), maneb (manganous ethylenebisdithiocarbamate), and nabam (disodium ethylene-1,2- bisdithiocarbamate), and to a lesser extent by the herbicide 2,4-D (2,4-dichlorophenoxyacetic acid). In pure culture studies with a bacterium whose end product in denitrification was nitrous oxide, the fungicides also caused strong inhibition of the respiratory nitrate reduction process; the insecticide carbaryl (1-naphthyl *N*-methylcarbamate), the phenylurea herbicides, 2,4-D, and propham (isopropyl carbanilate) also functioned as inhibitors, but to a lesser extent. It was

of special interest to observe that the inhibition by certain pesticides influenced the formation rate of nitrite and sometimes prevented the reduction of accumulated nitrite during incubation under anaerobic conditions. (Author abstract by permission)

76-1256. Bertagnolli, B. L.; Nadakavukaren, M. J. (Univ. Illinois, Dep. Bot., Urbana, IL 61801). **Some physiological responses of *Chlorella pyrenoidosa* to 2,4-dichlorophenoxyacetic acid.** *J. Exp. Bot.* 25(84): 180-188; 1974. (46 references)

The effects of 2,4-D were studied on *Chlorella pyrenoidosa* Chick (strain no. 211-8a). Eighteen hr exposure to 2,4-D at concentrations of 10n*M* to 5 m*M* did not significantly affect the degree of synchronization, increase in cellular dry weight and diameter, or pH of the culture medium. Cultures treated with 1 m*M* or higher concentrations showed a slight increase in the osmolarity of the culture medium beyond that attributable to added 2,4-D. Net oxygen uptake and production showed a statistically significant stimulation at 0.5 m*M* and inhibition at 5 m*M* 2,4-D. In cultures treated with 0.5 m*M* 2,4-D, there was a small decrease in the amount of carbohydrate excreted into the culture medium. In cultures treated with 0.5 m*M* and 5.0 m*M* 2,4-D there was an increase in the glycollate content of the culture medium. The total chlorophyll and protein contents of the nonaqueously isolated chloroplasts from *Chlorella pyrenoidosa* treated with 0.5 m*M* and 5.0 m*M* 2,4-D were similar to control values. Only a slight decrease in total pigment content of the 2,4-D treated cells was noted. From the data of this study it is postulated that in *Chlorella pyrenoidosa* the chloroplast is a target for 2,4-D action and that interference in photorespiratory processes may underlie the observed responses.

76-1257. Sandford, M. L.; Langlois, B. E. (Dep. Anim. Sci., Food Sci. Sect., Univ. Kentucky, Lexington, Ky 40506). **Effect of organochlorine pesticides on growth and biological activities of bacterial species important to the dairy food industry.** *J. Milk Food Technol.* 39(2): 90-94; 1976. (13 references)

When bacterial species common to the dairy food industry were grown in media containing 50 or 100 ppm DDT, dieldrin, or endrin, growth patterns were either slightly inhibited, completely inhibited, or not disturbed at all by the pesticides. Which of these 3 patterns emerged appeared to depend on bacterial species and pesticide type and concentration. All pesticides had a greater inhibitory effect on Gram-positive than on Gram-negative species grown in broth. Lactic acid bacteria was inhibited from acid production in broth plus 5 ppm chlordane or heptachlor, but was not affected in skim milk plus up to 100 ppm chlordane or heptachlor. Generation times for Gram-negative species grown in broth plus 10 ppm chlordane or heptachlor were not affected. Growth of Gram-positive species was inhibited in broth plus 10 ppm of chlordane or heptachlor, but was unaffected in skim milk containing similar concentrations of these pesticides. Several Gram-negative species showed increased generation times in 10 ppm heptachlor in skim milk.

76-1258. Adelman, I. R.; Smith, L. L., Jr.; Siesennop, G. D. (Dep. Entomol. Fish. Wildl., Univ. Minnesota, St. Paul, MN 55108). **Acute toxicity of sodium chloride, pentachlorophenol, Guthion, and hexavalent chromium to fathead minnows (*Pimephales promelas*) and goldfish (*Carassius auratus*).** *J. Fish. Res. Board Can.* 33(2): 203-208; 1976. (14 references)

The 96-hr LC50s for sodium chloride were 7650 and 7341 mg/l, for pentachlorophenol 0.21 and 0.22 mg/l, for Guthion (azinphosmethyl) 1.9 and 2.4 mg/l, for Cr(VI) 48 and 120 mg/l, for fathead minnows (*Pimephales promelas*) and goldfish (*Carassius auratus*), respectively. Threshold LD50s were reached in 6 days for sodium chloride (7650 and 7322 mg/l for fathead minnows and goldfish, respectively), and pentachlorophenol (0.21 and 0.21 mg/l), but were not attained in 11 days (termination of testing) with Guthion (0.76 and 0.80 mg/l) and hexavalent chromium (18 and 33 mg/l). With pentachlorphenol and Guthion goldfish were initially more resistant, but by termination there was no significant difference in LD50s between the two species. With hexavalent chromium the goldfish were more resistant throughout the 11-day test, and with sodium chloride goldfish were initially more resistant but at attainment of a threshold LC50 were less resistant. Use of toxicity curves for assessment of acute mortality permits interpretation not possible in 96-hr tests where LC50s are computed at 24-hr intervals. (Author abstract by permission)

76-1259. Adelman, I. R.; Smith, L. L., Jr. (Dep. Entomol. Fish. Wildl., Univ. Minnesota, St. Paul, MN 55108). **Fathead minnows (*Pimephales promelas*) and goldfish (*Carassius auratus*) as standard fish in bioassays and their reaction to potential reference toxicants.** *J. Fish. Res. Board Can.* 33(2): 209-214; 1976. (12 references)

Fathead minnows (*Pimephales promelas*) and goldfish (*Carassius auratus*) were compared for their suitability as standard bioassay fish. Both species showed the same variability of bioassay results when tested with four toxicants. Fathead minnows are recommended on the basis of their small size and on their capability for use in complete life cycle tests. On the basis of minimum variability of bioassay results, sodium chloride was superior for use as a reference toxicant. Both sodium chloride and pentachlorophenol seemed capable of detecting abnormal fish. On the basis of seven listed criteria either sodium chloride or pentachlorophenol (PCP) would be acceptable as a reference toxicant. (Author abstract by permission)

76-1260. Kuhar, M. J.; Simon, J. R. (Dep. Pharmacol. Exp. Ther., Johns Hopkins Univ. Sch. Med., Baltimore, MD 21205). **Acetylcholine uptake: lack of association with cholinergic neurons.** *J. Neurochem.* 22:1135-1137; 1974. (14 references)

Acetylcholine (ACh) uptake was studied in brain regions of widely varying content of cholinergic neurons and in the hippocampus after removal of its cholinergic

innervation by placing lesions in the medial septum. The studies were performed using both high and low media concentrations of ACh, since other neurotransmitter-specific neurons possess uptake mechanisms that are observed best with low media concentrations of neurotransmitter. Tissues were taken from male Sprague-Dawley rats. Hippocampal slices incubated with radiolabeled ACh (0.2 or 20 μM) at 37°C for 60 min had 8-10 times the amount of radioactivity in those samples maintained at 0°C. The uptake of ^{14}C-ACh (0.2 μM) was linear with time up to 60 min and tissue concentration up to 50 mg for each brain region examined. The uptake was inhibited about 50% when ouabain (1 mM) or NaCN (1 mM) were added to the medium along with the paraoxon. Similar results were obtained using higher (20 μM) concentrations of ACh. There was a large catabolism of radioactive ACh only when paraoxon was omitted from the incubation medium. In studies of ACh uptake, using both high and low media concentration of ACh, into hippocampal tissue ACh uptake in the hippocampus was not reduced in animals with septal lesions despite a large reduction of choline acetyltransferase activity, indicating a loss of cholinergic innervation. In order to establish whether ACh uptake may be associated with cholinergic neurons in some way which would not be revealed by the lesion experiments, ACh uptake was examined in striatal, hippocampal, and cerebellar tissue slices. Striking differences in the ACh contents of these three regions were found, with striatum having the highest content, cerebellum the lowest, and hippocampus intermediate. However, no regional differences in ACh uptake were found at either high or low concentrations. The results of these studies support the findings of other experiments that ACh is accumulated equally well by either slices of cerebellum or cerebral cortex. Since all neuronal tissue appears to accumulate AChEequally well whether cholinergic neurons are present or not, and since ACh uptake is observable only in the presence of an irreversible AChE inhibitor, it seems unlikely that the observed ACh uptake has any major physiological significance.

76-1261. Walz, D. A.; Kipfer, R. K.; Olson, R. E. (Dep. Biochem., St. Louis Univ., Sch. Med., St. Louis, MO 63104). **Effects of vitamin K deficiency, warfarin, and inhibitors of protein synthesis upon the plasma levels of vitamin K-dependent clotting factors in the chick.** *J. Nutr.* 105(8): 972-981; 1975. (44 references)

The levels of the vitamin K-dependent coagulation proenzymes in chick plasma were studied as compared with those of the rat, cow, and man. The effects of vitamin K deficiency, cyclohex imide, and warfarin treatment on the concentrazion of these factors in the chick were also studied. A vitamin K deficient diet was fed to chicks (1 day old) for 7 days. Before initial feeding, the prothrombin value was 75 ± 6 (SEM) Iowa Units/ml in 12 chicks. Prothrombin levels fell to less than 5% in 5 days with a half time of 1.5 days. Conversely, factors IX and X fell much more slowly relative to their initial concentrations, with IX dropping to 63% in 7 days and X to 50% in the same period. When 2 week old chicks fed a vitamin K-adequate diet from hatching were given 3 mg warfarin/100 g body weight at zero time, a similar result was obtained on a different time scale. Prothrombin fell to values less than 20% at 12 hr, with a half time of about 2 hr. Factors IX and X fell at a much more sluggish rate to about 60% of normal in 6 hr, then remained constant for the next 6 hr. The fact that vitamin K deficiency does not cause the same relative decrease in factors IX and X in the chick as it does with factor II (prothrombin), and that the apparent half times of these factors determined with warfarin and with cyclohex imide are different, indicates that neither vitamin K lack nor warfarin administration completely inhibits the synthesis of factors IX and X in the chick. Further, it suggests that in the chick the regulatory proteins mediating the vitamin K effect on the biosynthesis of factors IX and X have a higher affinity for vitamin K and a lower affinity for warfarin than the regulatory protein controlling factor II synthesis.

76-1262. Arora, S. K.; Bates, R. B. (Dep. Chem., Univ. Arizona, Tucson, AZ 85721). **Crystal structure of 1-(2-chlorophenyl)- 1-(*p*-chlorophenyl)- 2,2-dichloroethane.** *J. Org. Chem.* 41(3): 554-556; 1976. (8 references)

X-ray studies were performed on *o,p'*-DDD with an aim of gaining insight into its differences in effect from the structurally related insecticides and its resulting usefulness in treating tumors of the adrenal cortex. The conformations of the antitumor agent and the insecticides were compared. These conformations can be largely described in terms of the torsion angles about the C13-C14, C13-Cl, and C13-C7 bonds. About C13-C14, the drug possesses almost perfect staggering with the hydrogens *anti*. In the insecticides the deviation from perfect staggering is somewhat greater. In all three structures, one aromatic ring is within a few degrees of the butterfly angle; in the drug, it is the *o*-chlorophenyl ring, and the chlorine on this ring takes the position away from the other chlorines. The largest conformational difference comes in the rotation of the remaining *p*-chlorophenyl ring of each compound. In the drug, the 24° rotation decreases repulsion between the C14 hydrogen and the nearly *ortho* hydrogen on the *p*-chlorophenyl ring, and also between the chlorine on the *o*-chlorophenyl ring and the other *ortho* hydrogen on the *p*-chlorophenyl ring. In the insecticides, a chlorine replaces the hydrogen on C14, and further rotation is required to minimize the energy. From these studies it is apparent that the conformation of the antitumor agent in the crystal differs somewhat from the conformations of the crystalline insecticides. The slight differences noted may be responsible for the differences in activity, but this cannot as yet be firmly established.

76-1263. Rosic, N.; Milosevic, M. (Med. Fac., Beograd Univ., Belgrade, Yugoslavia). **Depressant effects of anticholinesterase drugs on avoidance behavior of rats: the influence of conditioned stimulus modalities.** *J. Pharmacol. (Paris)* 5(Suppl. 2): 86; 1974.

A study was made of the intensity and duration of depressant effects of paraoxon on the active avoidance behavior in rats. Recovery of avoidance depression was noted 6 hr after paraoxon injection. The duration of anticholinesterase depressant effects was also dependent on the type of conditioned stimulus modality which had been previously used in the training procedure. It is noted that the use of a noise as a conditioned stimulus can lead to a faster recovery of depressed avoidance behavior than can the use of a light.

76-1264. Toor, H. S.; Mehta, K.; Chhina, S. (Dep. Zool., Punjab Agric. Univ., Ludhiana, India). **Toxicity of insecticides (commercial formulations) to the exotic fish, common carp *Cyprinus carpio communis* Linnaeus.** *J. Res. Punjab Agric. Univ.* 10(3): 341-345; 1973. (11 references)

Common carp (*Cyprinus carpio communis*) were exposed under laboratory conditions to emulsions of endrin, endosulfan, dimethoate, and malathion, and the fish were observed at intervals up to 72 hr thereafter. Of the insecticides tested, endrin was the most toxic to these fish, followed by endosulfan, malathion, and dimethoate. The maximum sublethal dose of endrin was 0.0018 ppm and the minimum lethal dose was 0.003 ppm. For endosulfan, malathion, and dimethoate, these values were 0.005 ppm and 0.007 ppm, 17 ppm and 20 ppm, and 40 ppm and 45 ppm, respectively. Dimethoate affected the nervous system, the symptoms of toxicity being violent movements, irritability, excitation, reduced respiratory rate, and loss of equilibrium. Similar effects were observed with the other insecticides.

76-1265. Highman, B.; Gaines, T. B.; Schumacher, H. J. (Dep. Pathol., Univ. Arkansas Med. Cent., Little Rock, AR). **Sequential histopathologic, hematologic, and blood chemistry changes induced in mice by a technical and a purified preparation of 2,4,5-trichlorophenoxyacetic acid.** *J. Toxicol. Environ. Health* 1(3): 469-484; 1976. (14 references)

On days 6 through 14 of pregnancy, 378 mice recieved by gavage either 60 or 120 mg/kg 2,4,5-T. Moderate to severe histopathologic changes ensued. The most common cardiac lesion was rarefaction of myocardial fibers in both ventricles and occassionally in an atrium. Affected fibers were pale, swollen, and stippled. Myofibrils were reduced in number and spread apart by pale cytoplasm. The second type of cardiac lesion consisted of single or multiple foci of necrosis in the outer myocardium and occasionally in the interventricular septum. Occasionally both types of lesions were noted in the same animal. The thymus of mice given 2,4,5-T, particularly sick and moribund mice sacrificed more than 2 days after beginning treatment at 120 mg/kg, often showed marked atrophy. Lymphocytes were virtually depleted in the cortex and increased in the medulla. There was a reduction in size of the splenic follicles and in the number of germinal centers and lymphoid follicles, depletion of lymphocytes, and abundant nuclear debris in the phagocytic reticulum cells in the cortex, mainly in some of the moribund animals. Thyroid follicles were increased in size, often contained pale vacuolated colloid, and were lined by enlarged epithelial cells. Liver sections often revealed marked centri lobular or diffuse depletion of glycogen. Leukocyte counts were higher in treated animals. The mean erythrocyte counts and hemoglobin and hematocrit values of both controls and treated mice were lower in pregnant than in nonpregnant mice. The observed impairment of maternal health is apparently not a major factor for fetal abnormalities induced in dihybrid cross F_2 mice by 2,4,5-D.

76-1266. Parrish, P. R.; Schimmel, S. C.; Hansen, D. J.; Patrick, J. M., Jr.; Forester, J. (US-EPA, Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL). **Chlordane: effects on several estuarine organisms.** *J. Toxicol. Environ. Health* 1(3): 485-494; 1976. (18 references)

A study was conducted to determine the acute toxicity of technical grade chlordane to eastern oysters (*Crassostrea virginica*), pink shrimp (*Penaeus duorarum*), grass shrimp (*Palaemonetes pugio*), sheepshead minnows (*Cyprinodon variegatus*), and pinfish (*Lagodon rhomboides*). The effect of chlordane was examined on fertility, hatching success, and survival of sheepshead minnow fry. Chlordane proved acutely toxic to the estuarine organisms tested. Pink shrimp were the most sensitive organism; several individual died at concentrations less than 1 ppb. Grass shrimp died when exposed to concentrations in the low ppb range. Pinfish were about 4 times more sensitive to chlordane than were sheepshead minnows. Chlordane appeared slightly more toxic to the marine organisms than to freshwater organisms. Fertility of sheepshead minnow eggs and survival of embryos and fry was not significantly affected by the concentrations tested. Fry exposed to chlordane at 21.0 mg/l did not suffer significant mortality compared to controls, but they lost equilibrium and swam erratically. All the test animals accumulated chlordane to varying degrees.

76-1267. Kanazawa, J. (Natl. Inst. Agric. Sci., Minist. Agric., Tokyo, Japan). [**Spinal curvature of fish and pesticides.**] *Kagaku (Science-Tokyo)* 46(2): 108-115; 1976. (41 references) (Japanese)

In recent years, freshwater fish and marine fish living in coastal areas and bays have been found in large numbers with curved spines. Spinal curvature in fish was studied in relation to pesticides, citing many published articles showing a relationship between exposure of fish to pesticides and the abnormally curved spines. Special attention was given to the experimental results obtained on carp, killifish, and loach. Curved spines were found in fish surviving 3-5 hr exposure to pesticides at close to LC50 value. The specific types of pesticides which cause spinal curvature could not be definitely identified. However, there is reason to believe that many kinds of organophosphorus and *N*-methyl carbamate insecticides caused spinal

curvature due to fracture and dislocation. One of the mechanisms involved was considered to be abnormal contraction of muscles, with spasms caused by the cholinesterase inhibitors mentioned above.

76-1268. Korotkova, O. A. (All-Union Sci. Res. Inst. Chemical Plant Protect., USSR). **Pestitsidy i okruzhayushchaya sreda. Geterotsiklicheskie soedineniya (analiticheskiy obzor). [Pesticides and the environment. Heterocyclic compounds. (Analytical review).]** *Khim. Sel'sk. Khoz.* 13(11): 64-76; 1975. (64 references) (Russian)

Studies on the persistence, metabolism, and toxicity of heterocyclic pesticides are reviewed. Picloram is highly persistent in soil, but is rapidly degraded by UV light in aqueous solutions. It does not suppress soil microorganisms, and has low toxicity in aquatic organisms. Benomyl is relatively rapidly degraded by UV light and heat, and in water and plants. Fenazaflor is hydrolyzed in water, blood plasma, and liver. Thiabendazole is persistent in water and in soil. Methylthiophanate is rapidly metabolized in soil and in plant material, and has very low toxicity in warm-blooded organisms. Carboxin is oxidized to sulfoxide in soil. It has an LD50 of 2.68-3.2 g/kg in rats, and shows slight accumulation in the organism. Bromacil, terbacil, lenacil, and dimethirimol are noted for their very low toxicity in warm-blooded organisms. Pyramin is rapidly metabolized in soil by microorganisms, and has low toxicity. Bentazon does not influence the soil biological activity. Sencor is hydrolyzed in soil.

76-1269. Armstrong, D. A.; Millemann, R. E. (Dep. Fisheries Wildlife, Marine Sci. Cent., Oregon State Univ., Newport, OR). **Effects of the insecticide sevin and its first hydrolytic product, 1-naphthol, on some early developmental stages of the bay mussel *Mytilus edulis*.** *Marine Biol.* 28(1): 11-15; 1974. (17 references)

Mytilus edulis in seven different stages of development (unfertilized and recently fertilized eggs and larvae fertilized 32 hr previously) were exposed for 1 hr to different concentrations of sevin (carbaryl) and its first hydrolytic product, 1-naphthol. After exposure, the larvae and eggs were removed from the pesticide solution and returned to clean water. At 48 hr after fertilization the numbers of normal and abnormal larvae were determined and the 1-hr EC50 values (the effective concentrations that caused anomalous development of the test organisms) were calculated. The most sensitive stage was the one occurring shortly after fertilization at the appearance of the first polar body. Thereafter, sensitivity decreased with increasing age. The EC50 of sevin for the first polar body stage and the 32-hr stage were 5.3 and 24.0 mg/l, respectively; the EC50 of 1-naphthol for the first polar body stage was 5.2 mg/l. The EC50 values of sevin and 1-naphthol for the unfertilized egg were 20.7 and 24.5 mg/l, respectively. The effects of the toxicants on development were characterized by disjunction of the blastomers, a reduction in the rate of development, and asynchronous and unaligned cleavages.

76-1270. Weis, P.; Weis, J. S. (Dep. Anat., Coll. Med. Dent. New Jersey, Newark, NJ). **Schooling behavior of *Menidia menidia* in the presence of the insecticide sevin (carbaryl).** *Marine Biol.* 28(4): 261-263; 1974. (15 references)

Juvenile *Menidia menidia* were placed in aquaria and exposed to a single dose of Sevin (carbaryl) (100 ppb) in acetone. At 24 and 72 hr after dosing, the fish were observed in groups of five and schooling behavior was recorded. The school sizes of the control groups were remarkably consistent from day to day. The groups exposed to carbaryl consistently occupied twice the area of the control groups until they had been in clear water for 3 days, by which time their school sizes were virtually identical with those in the control groups. The disruption of schooling behavior in the carbaryl-treated fish was attributed to the accumulation of 1-naphthol, a toxic hydrolysis product of carbaryl. A toxic substance which interferes with normal schooling behavior could set up a vicious cycle, lowering the threshold of the exposed fish to the same or other toxic substances.

76-1271. Hikosaka, Y. (2nd Sch. Surg., Fac. Med., Nagoya City Univ., Nagoya, Aichi, Japan). **[Clinicopathological study on the effect of 3-amino-1,2,4-triazole on dog thyroid.]** *Nagoya Shiritusu Daigaku Igakkai Zasshi (J. Nagoya City Univ. Med. Assoc.)* 26(2): 99-111; 1975. (42 references) (Japanese)

Aqueous (2.5 and 5%) solutions of 3-amino-1,2,4-triazole (amitrole) were given as drinking water to 4 young male mongrel dogs for 37 or 50 wk during their total growing stage. In all dogs, soft, tumbnail-sized thyroeophymas appeared on both sides of the trachea, just beneath the thyroid cartilage, 6 mo after the beginning of dosing. The hardness of the goiter was greater during administration of the 5% solution. The thyreophyma showed histopathological changes similar to those which appeared in mice and rats given 3-amino-1,2,4-triazole, which comprised alteration and proliferation of follicular epithelial cells, but no neoplastic change. Low values of serum T3, T4, and T7, and an abnormally high ^{131}iodine uptake rate were seen in the experimental animals as well as a conspicuous reduction of response to TSH stimulation. No visible or histopathologically detectable change was seen in the pituitary, adrenal, liver, or kidney. The origins and mechanisms of these findings were discussed. The total intake of 3-amino-1,2,4-triazole was estimated as 860, 630, 970, and 1200 g per dog, respectively.

76-1272. Miller, D. S.; Kinter, W. B.; Peakall, D. B. (Mt. Desert Island Biol. Lab., Salsbury Cove, ME). **Enzymatic basis for DDE-induced eggshell thinning in a sensitive bird.** *Nature (London)* 259(5539): 122-124; 1976. (25 references)

Studies were made of the mechanism by which DDE causes eggshell thinning. Addition of DDE to an ATPase assay medium substantially inhibited all ATPase activities from freeze-dried whole homogenates of duck shell gland mucosa. However, in vitro sensitivity to low DDE concentrations varied, with only Ca-ATPase and Na,K-ATPase inhibited below 3 ppm. The most sensitive Ca-ATPase activity was associated with mitochondria. To detrmine whether shell gland enzymes were affected in vivo, 40 ppm DDE was fed to laying white Pekin ducks. This level caused 13% shell thinning after 4 days and 18% after 1-3 months. Thinning was maximal after about 1 week and then remained constant. Ca-ATPase activity in whole gland homogenates from these ducks was reduced 24% after 4 days and 31% after 1-3 months. The only other significant change was a transient reduction in Na,K-ATPase activity (41% after 4 days), which seemed unrelated to shell thinning as it returned to normal after 1-3 months. In contrast, the activity of Ca-ATPase in chicken shell gland was not inhibited by in vitro DDE concentrations up to 15 ppm, and feeding DDE did not reduce shell thickness or ATPase activity. The feeding of 40 ppm DDE to male ducklings for 4 weeks caused no change in Ca-ATPase or Na,K-ATPase activities in the intestine. It is suggested that CA (carbonic anhydrase), a soluble enzyme known to be involved in eggshell formation, has a minor role in shell thinning caused by DDE in duck shells, while a major role is proposed for Ca-ATPase inhibition by DDE. DDE may inhibit a calcium pump in duck shell gland mitochondria.

76-1273. Tokoro, T.; Suzuki, K.; Hayashi, K.; Otsuka, J. (Sch. Ophthalmol., Tokyo Med. Dent. Univ., Tokyo, Japan). [**Development of myopia induced by oral adminstration of a low acute toxicity organophosphorus pesticide, fenitrothion.**] *Nippon Ganka Gakkai Zasshi (J. Jpn. Ophthalmol. Soc.)* 80(1): 51-53; 1976. (6 references) (Japanese)

Four beagles were administered capsuled fenitrothion, p.o., twice weekly at dose rates of 5 mg/kg (1 dog), 1 mg/kg (2 dogs), and 0.5 mg/kg (1 dog) for one year. The refraction, corneal curvature radius, anterior chamber depth, lens thickness, and axial length were determined just before and four and nine months after the beginning of administration and 4 mo after discontinuing administration. Myopia was not observed after the beginning of administration; however, it was significant 4 mo after ending administration ($p < 0.05$). The intraocular pressure showed a significant elevation four month after the beginning of administration. It showed a tendency towards recovery to normal values thereafter. The corneal refractive power showed no change and no remarkable change in the individual refractive components was observed. These findings were similar in nature to those in dogs administered ethylthiometon. The degree of change caused by fenitrothion was lower than that by ethylthiometon.

76-1274. Yamazaki, H.; Shimazaki, K.; Szuki, A.; Yamashita, R.; Ide, H. (Dep. Pestic. Intox., Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Electronmicroscopic studies in the subacute toxicity tests of dichlorvos.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 121-143; 1974. (Japanese)

Dichlorvos was orally administered to Rhesus monkeys at dose rates of 0.1, 0.3, and 1.0 mg/kg/day for 6 mo and to rabbits at 0.2, 0.5, 1.5, and 5.0 mg/kg/day for 3 mo. The animals were sacrificed and autopsied to examine the changes in external eye muscles, liver, and kidney by electron microscopy. In the monkeys, alterations of junctional fold and synaptic vesicles were observed on the muscle motor end-plates. There was also a decrease of mitochondria. In monkey liver cells, proliferation of smooth-surfaced follicles, swelling and atrophy of mitochondria, and opening of rough-surfaced follicles were observed. Effects on mitochondria and opening of smooth-surfaced follicles were seen in the monkey kidney. In rabbits, alterations of junctional fold, synaptic vesicles, and mitochondria were observed on the motor end-plate of external eye muscles. Vacuolation of liver cells, increase of smooth surfaced and rough surfaced follicles, and deformation of mitochondria were observed in rabbit liver. Swelling and vacuolation of mitochondria in the cells of renal tubules were also observed in rabbit kidney.

76-1275. Horiguchi, Y.; Yanagisawa, T.; Abe, E.; Sasaki, K.; Kurosawa, K. (Dep. Pestic. Intox., Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Electroencephalographic studies on the effects of organochlorine and organophosphorus pesticides in human and animal experiments. Pt. 3. I. Animal experiments using rabbits and monkeys.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 144-148; 1974. (Japanese)

Dichlorvos was administered acutely and subacutely to rabbits and Rhesus monkeys, and the changes in ECG, EEG, and serum and erythrocyte ChE activity were observed. The results of acute administration showed rabbits and monkeys, given relatively small amounts of dichlorvos, exhibiting bradycardia and arrhythmia in the ECG soon after administration, with slow recovery. The EEG showed an arousal type wave form but paroxysmal abnormal rhythms did not appear. In animals given large amounts of dichlorvos, bradycardia and arrhythmia appeared in the ECG soon after administration, but the animals did not recover-they died. Paroxysmal waves did not appear in the EEG, and deaths due to brain disturbance were lower in monkeys than in rabbits. The results of subacute administration (0.2, 0.5, 1.5, and 5.0 mg/kg/day for 3 mo in rabbits and 0.1, 0.3, and 1.0 mg/kg/day for 3 mo in monkeys) did not appear on the weekly EEG records.

76-1276. Horiguchi, Y.; Yanagisawa, T.; Sasaki, K.; Ide, H.; Niitsu, H.; Ueki, S. (Dep. Pestic. Intox., Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Electroencephalographic studies on the effects of organochlorine and**

organophosphorus pesticides in human and animal experiments. Pt. 3. II. Electroencephalographic studies on the applicators of pesticides.] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 149-155; 1974. (Japanese)

Neurological examinations, consisting mainly of EEG, were done on 28 men and 11 women engaged in organophosphorus pesticide application for many years. Before and after the recent application, EEG was normal in 16 men, and the appearance of more than moderately slow alpha activity of 8-9 c/s was recognized in 12 men, including 2 men with slow waves. Just after application, EEG was examined in 14 men. It was found that the 2 men who had shown slow waves indicated a slight aggravation. Before application, EEG was normal in 10 women, and the appearance of slow alpha activity was observed in one woman. Just after application, EEG findings were almost the same as those before application. Neurological findings were normal on every person. No difference in serum ChE activity was found before or after application of pesticides.

76-1277. Hayashi, T.; Abe, E.; Sasaki, K.; Kurosawa, K.; Shimazaki, K.; Yanagisawa, T. (Dep. Pestic. Intox., Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Experimental studies on ocular disturbances due to organophosphorus pesticides. Pt. 3. I. On dichlorvos-induced ocular disturbance in monkey and rabbit.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 156-167; 1974. (2 references) (Japanese)

Subacute p.o. administration of dichlorvos was carried out for 3 mo in rabbits and Rhesus monkeys. The dose rates were 0.2, 0.5, 1.5, and 5.0 mg/kg/day, dissolved in olive oil for rabbits; and 0.1, 0.3, and 1.0 mg/kg/day, injected into banana fruit, for monkeys. One rabbit of the 1.5 mg group died by a mistake in administration, and one rabbit of the 5 mg group died of pulmonary congestion. The latter case was considered to be caused by dichlorvos. No inhibition of body weight increase was observed; however, reduction of serum and erythrocyte ChE activity was clearly recognized in the 0.5, 1.5, and 5.0 mg groups. No abnormality was found in 2 monkeys of the 1.0 mg group. Serum and erythrocyte ChE activity in monkeys declined in response to the dose rate. In monkeys of the 1.0 mg group, erythrocyte ChE activity was 10% of that before administration. Ophthalmological examination of monkeys revealed the change of -1D to -2D in 3 monkeys in the 1.0 mg group. No change was found in the cornea, pupil, or eye fundus.

76-1278. Abe, E.; Kurosawa, K.; Sasaki, K.; Shimazaki, K.; Yanagisawa, T.; Matsushima, S. (Dep. Pestic. Intox., Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Studies on the toxicity of rabcide (phthalide). On the acute and chronic toxicity of phthalide to rat and mouse.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 216-250; 1974. (Japanese)

Rats and mice were fed a diet containing 5, 1, 0.2, and 0.04% phthalide (a fungicide against *Pyricularia oryzae* on rice plants, 4,5,6,7-tetrachlorophthalide) for 2 yr. A control group was fed an ordinary diet. After 6 and 12 mo of feeding, all remaining animals were sacrificed and examined. No change of the general situation was observed. Inhibition of body weight increase was clearly recognized in the 5% group. Intake of diet and water was greater only in the 5% group. No consistent trend of RBC, WBC, hemoglobin, hematocrit percentages, or percentages of distribution of fractions of leucocytes was established. When total protein, albumin-globulin ratio, cholesterol content, urea nitrogen, blood sugar, and SGPT were studied, only the last-mentioned value was reduced in the 5% group compared with all the groups. According to pathohistological examination, fatty degeneration and necrosis of the liver cells were recognized. Turbidity and swelling of renal tubular epithelial cells, denaturation of fatty tissue, and increase and regeneration of urinary casts were seen to a lesser degree. However, the dose-response relationship of these symptoms was not clear. Rabcide is the commercial name of phthalide.

76-1279. Kobayashi, K.; Akitake, H. (Lab. Fish. Chem., Fac. Agric., Kyushu Univ., Fukuoka, Japan). **Studies on the metabolism of chlorophenols in fish. I. Absorption and excretion of PCP by goldfish.** *Nippon Suisan Gakkaishi (Bull. Jpn. Soc. Sci. Fish.)* 41(1): 87-92; 1975. (6 references)

The rate of absorption and retention was studied of PCP by goldfish, *Carassius auratus*, as was toxicity and excretion of absorbed PCP. Fish were exposed to PCP in concentrations of 0.1, 0.2, or 0.4 ppm. At 0.1 ppm no fish showed any evidence of adverse effects of PCP. PCP concentration in the fish increased with exposure time, resulting in a concentration factor from the original PCP-medium of 1000 after exposure for 120 hr. At 0.2 ppm medium the PCP concentration also increased with time in the early periods of exposure. After the concentration reached about 100 μg PCP/g, the fish began to die and no surviving fish showed PCP concentrations higher than 115 μg/g. At 0.4 ppm the PCP concentration increased with time reaching 111 μg/g after 6 hr. However, fish began to die at 4 hr and no fish survived more than 6 hr. When two groups of fish with mean concentrations of 23.5 and 41.6 μg/g were transferred to running water, the concentrations of PCP decreased, falling to half within 10 hr and to about 20% of the initial values after 20 hr. In another experiment fish were exposed to 0.2 ppm PCP for 6, 12, 24, and 48 hr. No effect on retention of PCP by the length of exposure to the chemical was detected. Most of the PCP accumulated in the fish was not decomposed.

76-1280. Kobayashi, K.; Akitake, H. (Lab. Fish. Chem., Fac. Agric., Kyushu Univ., Fukuoka, Japan). **Studies on the metabolism of chlorophenols in fish. II. Turnover of absorbed PCP in goldfish.** *Nippon Suisan Gakkaishi (Bull. Jpn. Soc. Sci. Fish.)* 41(1): 93-99; 1975. (7 references)

The turnover of absorbed PCP was studied in various tissues of goldfish, during both absorption in a PCP-medium and subsequent excretion in running water. Confirmation was studied of the decomposition of PCP in the various tissues. Forty goldfish were placed in 200 liters of a ^{14}C-PCP medium (PCP, 0.2 ppm) at 18°C. Exposure continued for 1, 5, 12, and 24 hr. Although PCP concentration in the gallbladder was the lowest among the tissues assayed, after a 1 hr exposure it rapidly increased with time until it reached values of 43.6 μg PCP/g at 5 hr and 539 μg PCP/g at 24 hr. The concentration of PCP in the gallbladder reached 1,077 μg/g after 24 hr culture in running water. The PCP concentration in each of the other organs studied gradually increased with the exposure time in the PCP-medium and then gradually decreased after transfer to running water. After gallbladder concentrations, the highest concentration occurred in blood, followed by kidney, digestive tract, hepatopancreas, and gills. Muscle always showed lowest concentrations among all tissues studied. The amount of PCP in the gallbladder eventually accounted for 41% of that contained in the whole body. It is suggested that the abrupt decrease of PCP concentration in the blood immediately following transfer of the fish to running water might be due to passive diffusion through the gills. The increase in specific activity as noted in the gallbladder indicates that a part of the PCP decomposed in the fish. It is suggested that most of PCP transferred to the hepatopancreas was detoxified by sulfate conjugation or by decomposition and then partly transferred to the gallbladder and bile. The slower decrease of the PCP concentration in fish after concentration had reached about 20% of the initial value which they had before transfer to running water is due to storage of PCP in the gallbladder. The abrupt increase of PCP concentration in the digestive tract which occurred immediately after transfer to running water may be due to an initial secretion of bile stored in the gallbladder which contained PCP in a high concentration. It is suggested that decomposition of PCP in fish is of little consequence in detoxification of PCP when compared to sulfate conjugation.

76-1281. Black, W. M.; Neely, D. (Dep. Plant Pathol., Univ. Illinois, Urbana, IL 61801). **Effect of soil-injected benomyl on resident earthworm populations.** *Pestic. Sci.* 6(5): 543-545; 1975. (10 references)

Soils pressure-injected with benomyl (36 g/m²) 1/4, 1, 2, or 3 years previously or at 18 g/m² 4 years previously were examined to determine the earthworm populations. Earthworms that emerged within 20 min following a soil drench with formalin were counted. A significant reduction in the earthworm population occurred soon after benomyl treatment; however, within months the earthworm population increased substantially. The earthworm populations in plots treated with benomyl one or more years previously did not differ significantly from untreated plots. (Author abstract by permission)

76-1282. Machin, A. F.; Rogers, H.; Cross, A. J.; Quick, M. P.; Howells, L. C.; Janes, N. F. (Central Vet. Lab., Min. Agric. Fish. Food, New Haw, Weybridge, Surrey, England). **Metabolic aspects of the toxicology of diazinon. I. Hepatic metabolism in the sheep, cow, pig, guinea-pig, rat, turkey, chicken and duck.** *Pestic. Sci.* 6(5): 461-473; 1975. (39 references)

The phosphorothionate insecticide diazinon was incubated with liver microsomes from the sheep, cow, pig, guinea-pig, rat, turkey, chicken, and duck. Metabolism by liver slices of most of these species was also examined. Hydroxydiazinon, isohydroxydiazinon, dehydrodiazinon, their oxons, and diazoxon were identified and determined quantitatively or semi-quantitatively. An eighth metabolite was tentatively identified as the 6-aldehyde analogue of diazinon. Yields and rates of production of these metabolites varied greatly between species. Production of oxons was not generally correlated with susceptibility to diazinon poisoning, although it was lowest in the least susceptible animal, the sheep. The degradation of oxons by liver slices was too slow to explain the low toxicity of diazinon to the mammals. The relative importance of hepatic and extrahepatic metabolism in determining toxicity to vertebrates is discussed. (Author abstract by permission)

76-1283. Hallmen, U. (Dep. Bot., Univ. Stockholm, Lilla Prescati, S-104 05 Stockholm, Sweden). **Translocation and complex formation of picloram and 2,4-D in rape and sunflower.** *Physiol. Plant.* 32(1): 78-83; 1974. (35 references)

A comparison is made between 2,4-D and picloram in regard to complex formation and mobility in sunflower, susceptible to both herbicides, and in rape, susceptible to 2,4-D but more tolerant to picloram. Both sunflower and rape absorbed the two herbicides almost entirely. After 3 days very little was left unabsorbed. In sunflower there was a rapid translocation of 2,4-D downwards in the plant, followed by extrustion of the herbicide through the roots. After 9 days about half the applied activity was found in the nutrient solution. In picloram-treated sunflower, the radioactivity was found in all parts of the plants. However, only small amounts of activity were still found in the nutrient solution after 9 days. A great part of the picloram recovered was in the state of water-soluble complexes, which could be hydrolyzed in NaOH. In 2,4-D-treated rape, radioactivity was recovered in all parts of the plant and after 9 days small amounts were found also in the nutrient solution. Most of the activity recovered was in the CH_2-Cl_2-soluble fraction and concentrated in aerial parts of the plant other than the treated leaf. Most of the 2,4-D recovered in rape was in free unchanged form. In the picloram-treated rape, most of the radioactivity was still found in the treated leaf after 9 days. No activity at all was found in the roots or in the nutrient solution and only traces were found in the TCA-insoluble fraction. From the results of this study, it is clear that 2,4-D in susceptible sunflower and rape exists mainly in the free state and only to a small extent in the state of water-soluble complexes or associated to the TCA-insoluble fractions of the plants. The results of this study indicate that there is a correlation

between translocation of the herbicide and occurrence of the herbicide in free unchanged form. It is suggested that there is a common immobilization mechanism in related species working effectively on picloram but not on 2,4-D. The present study indicates that this mechanism may be a binding of picloram in water-soluble complexes, but whether this mechanism occurs in other crucifers beside rape is not known.

76-1284. Kirkpatrick, B. L.; Kharbanda, P. D.; Sinclair, J. B. (Dep. Botany, Univ. Illinois, Urbana, IL). **Translocation of ^{14}C-chloroneb fungicide in soybean after leaflet application.** *Plant Dis. Rep.* 60(1): 68-70; 1976. (13 references)

Chloroneb and a metabolite were detected in soybean seedlings following foliar application. One unifoliolate leaf for each of 2 seedlings was treated with 20 μl of the fungicide solution 14 days after emergence by gently rubbing the central portion of the adaxial surface with the side of the dispensing syringe. Studies were made on the parts of the plants at 24 and 72 hr after treatment. Plant parts with their percentage total activity, corrected for background, after 24 and 72 hr, respectively, were: treated leaf, 93 and 70; stem tissue above treated leaf, 2 and 10; opposite unifoliolate leaf, 1 and 2; hypocotyl and epicotyl, 1 and 2; cotyledons, 2 and 9; and roots, 2 and 6. The greatest percentage activity occurred in the leaf, but this decreased with time as other tissues increased in activity. The ^{14}C-activity moved acropetally through the veins in both treated leaflets. Activity was noted in tissues above and below the node of the treated leaf with the cotyledons showing the greatest accumulation of activity that appeared to increase with time. Chloroneb was detected on TLC plates in extracts taken 48 hr after treatment from trifoliolate leaflets and in tissues above the node of the treated leaf but not in the cotyledons. After 96 hr, chloroneb was only detected in the treated leaflet. A metabolite with an Rf = 0.7 was detected only in cotyledons of plants examined 48 hr after treatment, but was detected in all 3 tissues from plant extracts analyzed 96 hr after treatment, suggesting that chloroneb was translocated upward and a metabolite was translocated downward. This may also suggest that a metabolite was either being synthesized, accumulating to detectable quantities, or both, at 96 hr post-treatment.

76-1285. Verma, D. C.; Tavares, J.; Loewus, F. A. (Div. Cell Mol. Biol., State Univ. New York, Buffalo, NY 14214). **Effect of benzyladenine, 2,4-dichlorophenoxyacetic acid, and D-glucose on *myo*-inositol metabolism in *Acer pseudoplatanus* L. cells grown in suspension culture.** *Plant Physiol.* 57(2): 241-244; 1976. (29 references)

The effects of benzyladenine, 2,4-D, and D-glucose were studied on the uptake and metabolism of labeled *myo*-inositol in *Acer pseudoplatanus* cells grown in suspended cultures. Suspension cultures of *Acer pseudoplatanus* L. cells grown for 15 days in medium contained 3% sucrose, 1 mg/l 6-benzylaminopurine (BA), and 0.1 mg/l 2,4-D. These cultures removed newly added *myo*-inositol-2-^{3}H up to 100 mg/l in 24 hr, and used up to 20% of this cyclitol for pectin biosynthesis. Raising the BA content of the growth medium 10-fold drastically reduced uptake of *myo*-inositol leaving very little available for pectin biosynthesis. The increased level of cytokinin did not affect cell growth as measured by packed cell volume or by dry weight, or monomer composition of pectic polysaccharides. Little or no effect on *myo*-inositol uptake was caused by increasing 2,4-D 10-fold. However, this change did reduce the amount of *myo*-inositol utilized for pectin biosynthesis. Cells grown in this medium for 15 days did not remove any added *myo*-inositol when 3% glucose was included. When a trace amount of D-galactose-1-^{14}C was supplied to cells after 15 days of growth in normal, high BA, or high 2,4-D media, no significant variations in uptake or utilization of label among the 3 growth conditions was noted. Of primary interest in this study is the finding that high BA-grown cells readily utilized labeled galactose, but not *myo*-inositol. This selective effect may be significant in growth regulation.

76-1286. Vaisberg, A. J.; Schiff, J. A. (Inst. Photobiol. Cells Organelles, Brandeis Univ., Waltham, MA). **Events surrounding the early development of *Euglena* chloroplasts. 7. Inhibition of carotenoid biosynthesis by the herbicide SAN 9789 (4-chloro-5-(methylamino)- 2- (α,α,α,-trifluoro-*m*- tolyl)-3(2H)pyridazinone) and its developmental consequences.** *Plant Physiol.* 57(2): 260-269; 1976. (32 references)

The influence of SAN 9789 on specific membrane constituents in the morphological assembly of chloroplast membranes and the biosynthesis of other membrane components was studied in *Euglena* chlorplasts. The results of the study allow the concludion that SAN 9789 inhibits carotenoid synthesis selectively in *Euglena* cells leading to the accumulation of phytoene. This inhibition causes a loss of thylakoid membrane structure in dividing cells and leads to a block in membrane formation during light-induced plastid development in resting cells. At the same time there is an inhibition of Chl biosynthesis. Studies in which the amount of carotenoid in the cells was varied by selection treatment with SAN 9789 prior to cessation of cell division and light induction of chloroplast development show that the amount of Chl formed is proportional to the amount of carotenoid present. Therefore, the formation of plastid thylakoid membranes requires the simultaneous availability of the membrane components and this is normally achieved by an elaborate coregulation of the biosynthesis of these components to ensure that the correct amounts are usually present. If the synthesis of one set of components is stopped, the synthesis of other components is also stopped and membrane assembly is halted. The high specificity of SAN 9789 as an inhibitor of carotenoid synthesis and, therefore, as an inhibitor of the formation of membrane components and their assembly indicates that this compound may be useful in studies of the biochemistry of membrane formation.

76-1287. Gertig, H.; Nowaczyk, W. (Dep. Food, Inst. Biol. Pharm., Med. Acad., 61-771, Poznan, Poland). **The influence of lindane on enzyme activity in the tissues of rats on protein rich diet.** *Pol. J. Pharmacol. Pharm.* 27: 529-534; 1975. (27 references)

The influence of lindane was studied on the activity of acid and alkaline phosphatases, GOT and GPT transaminases, and lactate dehydrogenase in male Wistar rats fed standard and protein rich diets. Rats were given daily p.o. aqueous suspension of lindane at 1/10 LD50, 8.8 mg/kg. The serum alkaline phosphatase (AcP) activity decreased, but not significantly so, at 1, 3, and 4 months of lindane treatment in rats on a standard diet. Lindane fed to rats on protein rich diets significantly decreased the AcP activity after 3 to 4 months intoxication. It is suggested that the increased protein significantly decreased the activity of this enzyme. Comparisons of the acid phosphatase (AP) activity in rats on standard diets and those on protein rich diets suggest that the excess protein potentiates the action activating or inactivating lindane in relation to AP. No statistically significant differences were noted in the activity of GOT and GPT determined in homogenates from the liver of lindane treated rats on a standard diet. In lindane treated rats on a protein rich diet, after 1 month, the GOT and GPT activities were significantly decreased. After 2 and 3 months time the activities increased, only to decrease again after 4 months treatment. Lactate dehydrogenase (LDH) activity oscillated depending on the time of lindane treatment in rats both on standard and protein rich diets. The number of animals participating in the study decreased as time went on, more so in the group fed the protein rich diet. This may suggest an increased toxicity to rats on diets containing a considerable amount of protein.

76-1288. Szember, A.; Gostkowska, K.; Furczak, J. (Dep. Agric., Microbiol., Acad. Agric., Leszcznskiego 7, Lublin, Poland). **The intensity of ammonification and nitrification in the soil under legumes in monoculture and in crop rotation with constant application of herbicides. Part I.** *Pol. J. Soil Sci.* 6(2): 141-147; 1973. (19 references)

An experimental system was designed to observe the influence of a herbicide on biological processes significant for soil fertility. Studies were conducted of ammonification and nitrification in soil under conditions of differentiated field cultivation. It appeared that the cultivation systems applied did not significantly affect the intensity of the ammonification processes in the soil of those plots not sprayed with a herbicide. Differences in the reaction of ammonifiers, in relation to the cultivation system, were found soon after spraying on plots treated with aretit (dinoseb-acetate). When applied for the third time to kill weeds in the monoculture of legumes, aretit did not have a negative effect on the growth and activity of the ammonifiers population in the soil. However, when used only once, the herbicide caused a periodic decrease in the number of ammonifiers and weakened the ammonification strength of the soil. The decrease in the ammonification intensity observed after a single application of aretit, followed by a rapid regeneration of the ammonification ability of the soil, suggests a selective action of this preparation. The results also suggest that periodic contact of the herbicide with the soil can establish the domination of species or strains resistant to the herbicide applied. This study confirms the information of other investigations in that a high sensitivity of nitrifiers to nitrophenolic herbicides is reported. Aretit applied in an average field dose very distinctly influenced the nitrification activity of the soil. At 12 months after application, the activity of nitrifiers in the soil treated with the herbicide remained weaker than in areas where the chemical was not applied. Although nitrophenolic herbicides are not included in the group of preparations remaining long in the soil, it seems that their extended action on sensitive microorganisms in some soils should be taken into account.

76-1289. Flint, D. R. (Chemagro Div., Baychem Corp., Kansas City, MO 64120). **The metabolism of Namacur in pineapple.** *Proc. North Cent. Branch Entomol. Soc. Am.* 29: 146; 1974.

The biotransformation and deposition of Nemacur (phenamiphos) residues in pineapple fruit and foliage were examined following pesticide application to fruited plants growing outdoors. The chemical was applied via stem injection, foliar spray, or soil drench. Both upward and downward translocation were observed following injection into the fruit soil. The uptake of total residues following soil application was nearly linear over a 90-day period, whereas the total residue level after foliar application reached a maximum and declined over a 30-day interval. The total residues in the fruit and foliage were less following soil application at 20 lb AI/acre than after foliar treatment at about 1 lb AI/acre. Biotransformation occurred primarily via thiooxidation and hydrolysis of the aryl-phosphate bond, the phenolic hydrolysis products being conjugated with glucose to yield water-soluble residues. The major organosoluble metabolite was Nemacur sulfoxide, and the major water-soluble metabolite was the corresponding sulfoxide-phenol-glucoside.

76-1290. Whitacre, D. M.; Schwemmer, B. A.; Schulz, K. L. (Velsicol Chem. Corp., Chicago, IL 60611). **The fate of the phosphonothioate insecticide leptophos in plants and animals.** *Proc. North Cent. Branch Entomol. Soc. Am.* 29: 146-147; 1974.

Tomatoes and lettuce were used to study the metabolic fate of ^{14}C-leptophos. Major pathways of metabolism have also been elucidated for other plants. This moiety is very stable to the spectrum of enzyme activity in these plant species. In all plants the parent leptophos is the major residue at almost all intervals of time up to and exceeding 30 days. Depending on the plant species and on the interval between treatment and harvest leptophos oxon, 3-bromo-2,3-dichlorophenol, *O*-methyl phenylphosphonothioic acid, *O*-methyl phenylphosphonic acid, and phenyl phosphonic acid were also present in

more or less small quantities. Polar metabolites resulting from hydrolysis of the phenoxy bond were generally not associated with biological materials except for 4-bromo-2,5-dichlorophenol, which was present as a salt or conjugate in small amounts in some cases. Leptophos is metabolized more readily by rats than by plants. The majority of a dose of leptophos is rapidly excreted in the urine of the rat, while the bulk of the remaining amount is eliminated in feces. The combined phenyl phosphonic acids and 3-bromo-2,5-dichlorophenol are the major metabolites. After metabolism in mammals, relatively little intact leptophos or leptophos oxon remains.

76-1291. Miura, T.; Takahashi, R. M. (Mosquito Contr. Res. Lab., Fresno, CA 93727). **Toxicity of TH-6040 to freshwater crustacea and the use of a tolerance index as a method of expressing side effects on nontargets.** *Proc. Pap. Annu. Conf. Calif. Mosq. Control Ass.* 42: 177-180; 1974. (7 references)

Results are presented on toxicity of TH-6040 (difluron) on freshwater crustaceans in the laboratory and outdoors in artificial containers. Mosquitoes used were either from a laboratory colony (*Culex tarsalis* Coquillett) or collected in the field (*Aedes nigromaculis* (Ludlow)). The mosquitoes were exposed to 0.05 ppm TH-6040. In studying the effects on the nontarget organisms it was noted that the water flea population was markedly reduced three days after treatment, but the population slowly recovered. Typical symptoms were lessened filter feedings and movements; reproduction was also suspended for a week. Copepod populations responded to the treatment in the same way as did the water flea population, but the magnitude of reduction was small and the interval of the recovery period was short. The seed shrimp population showed no harmful effect. When TH-6040 is used at the required rate for *A. nigromaculis* control, tadpole, clam and shrimp populations may be reduced, but will probably be recovered. When used for *C. tarsalis* control, the side effects may not be as severe. In comparison with TH-6040, the biological activity of methoprene is highly selective; when it was applied at the rates for mosquito control, there was no measurable deleterious effect on the fresh water crustaceans.

76-1292. Marking, L. L. (U.S. Fish Wildlife Serv., Fish Control Lab., La Crosse, WI 54601). **Toxicity of the synthetic pyrethroid SBP-1382 to fish.** *Prog. Fish Cult.* 36(3): 144; 1974.

A new experimental insecticide, SBP-1382 (5-benzyl-3-furyl ester of chrysanthemate) is extremely toxic to both coldwater and warmwater fish of fingerling size in standard, static, laboratory tests. The 96-hr LC50 ranged from 1-5 μg/liter for coho salmon (*Oncorhynchus kisutch*), chinook salmon (*Oncorhynchus tshawytscha*), rainbow trout (*Salmo gairdneri*), lake trout (*Salvelinus namaychus*), brook trout (*Salvelinus fontinalis*), carp (*Cyprinus carpio*), white sucker (*Catostomus commersoni*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), and yellow perch (*Perca flavescens*). The 96-hr LC50 for channel catfish (*Ictalurus punctatus*) was 15 μg/l. The synthetic pyrethrin was significantly more toxic at low than at high water temperatures and was equally toxic to various species in waters of different hardness and pH. Although the chemical shows potential as a fish toxicant, registration would require extensive study in nontarget organisms.

76-1293. Mertens, H. W.; Steen, J. A.; Lewis, M. F. (Aviation Psychol. Lab., FAA Civil Aeromed. Inst., Oklahoma City, OK). **The effects of mevinphos on appetitive operant behavior in the gerbil.** *Psychopharmacologia* 41(1): 47-52; 1975. (16 references)

The effect of the organophosphate mevinphos on the performance of gerbils was studied in three appetitive operant schedules. Male gerbils were exposed by i.p. injection to doses of 0.025, 0.05, 0.10, 0.20, and 0.30 mg/kg mevinphos. A different pair of gerbils served in each of the following schedules of reinforcement: FR 25, FR 75, DRL 12-sec, DRL 20-sec, and VI 1-min. The results of the study indicate that performance of gerbils in three appetitive operant schedules is affected by mevinphos at the same dose levels which produce observable somatic signs of poisoning in gross behavior. No signs of poisoning in gross behavior or consistent effects on operant performance were noted in any gerbil at dose levels of 0.10 mg/kg and below. Observable signs of poisoning were apparent at doses of 0.20 mg/kg and above. Overt somatic signs such as ataxia and salivation were noted in the gerbils. These are the same symptoms noted in humans suffering from organophosphate poisoning. Substantial decrements in performance appeared in FR and VI schedules at the same dose levels. At the 0.20 mg/kg dose level, mevinphos typically caused pauses in responding between periods of normal responding. This caused decrements in overall session response rates. In spite of effects on gross behavior, DRL performance was normal at the 0.20 mg/kg dose. In all reinforcement schedules, including DRL, the 0.30 mg/kg dose produced severe somatic symptoms of poisoning and disruption of operant performance. Debilitation was obvious and very long periods of no response were frequent at the 0.30 mg/kg dose level. The association of mevinphos-induced performance deficits with observable somatic signs of poisoning in the gerbil suggests that the mechanism of mevinphos effect may be at a peripheral level. If so, the relative insensitivity of gerbil performance to mevinphos in the DRL schedules, as compared to performance in FR and VI schedules, may reflect a less critical involvement of peripheral mechanisms due to the low response rates generated by the DRL schedules. The possible variation in effect of mevinphos as a function of species and task suggests the need to study mevinphos and other organophosphate compounds used in aerial application with a variety of tasks and species, especially higher species, in order to develop an adequate data base for predicting effects on humans.

76-1294. Medved, L. I. (All-Union Sci.-Res. Inst. Hyg. Toxicol. Pestic., Polymers, Plastics, Kiev, USSR). **Progress in pesticide toxicology in the USSR.** *Pure Appl. Chem.* 42(1-2): 67-76; 1976. (7 references)

In the USSR, the study of pesticide toxicity and toxicodynamics began in 1932. All compounds used are assessed and hygienic standards of acceptable concentrations in foods, air, and water are calculated. In the past, toxicologists were primarily interested in the prevention of acute and chronic poisoning, but in the past 10 yr, particular attention has been paid to delayed effects, alternative organotoxicity, and the allergenic properties of pesticides. Highly toxic persistent and stable substances with adverse delayed effects are strictly forbidden; these substances include cyclodienes and other stable organochlorine substances, systox, and parathion. The effects of pesticides at the whole body, organ, cellular, and subcellular levels are determined, as are some molecular peculiarities of the organophosphate chemicals which result in their hepatotrophy, embryotoxicity, teratogenicity, and morphological blood content effects. The highest levels of DDT and its metabolites are found in cholesterol esters, while lindane occurs primarily in glycerylates, and polychlorocamphene occurs in the phospholipids of the central nervous system. Prolonged exposure to DDT can affect liver function and structure, increase the susceptibility of the cardiovascular system to coronarospastic agents, and accelerate the development of atherosclerosis and autoaggressive antihepatic and antierythrocytic antibodies. The adverse effects of DDT ingestion on pregnancy, delivery, and posterity are related to disturbances of mitochondrial function, changes in cellular and intracellular membrane permeability, their bioelectric properties and intracellular regulatory mechanisms, and alterations in catecholamine, serotonin, and histamine metabolism.

76-1295. Korte, F. (Inst. Oekol. Chem. Tech., Univ. Muenchen-Weihenstephan, Freising-Weihenstephan, Germany). **Moeglichkeiten zur Verbesserung der Toxiolkogischen Beurteilung von Pestiziden. [Possibilities for improvement of the toxicological evaluation of pesticides.]** *Qual. Plant.-Plant Foods Hum. Nutr.* 21/2): 231-238; 1974. (9 references) (German)

During the improvement of the toxicological evaluation of pesticides, new problems have appeared. Two of the most important problems of modern tox icology are the question of the extrapolation of the results of animal experiments to man and the design and performance of toxicological research to determine the secondary effects of pollutants on ecosystems. The lack of a generally applicable system of evaluation makes the estimation of the risk unreliable; thus the need to develop new approaches to the toxicological evaluation of pesticides is indicated. Improvements should be expected if a single, valid system of evaluation is developed cooperatively on an international basis.

76-1296. Plotnick, H. B.; Conner, W. L. (Natl. Inst. Occupational Safety and Health, Cincinnati, OH 45202). **Tissue distribution of ^{14}C-labeled ethylene dibromide in the guinea pig.** *Res. Commun. Chem. Pathol. Pharmacol.* 13(2): 251-258; 1976. (9 references)

Some of the pathologic changes which occur in male guinea pigs of the Hartley strain following ethylene dibromide (EDB, 30 mg/kg, i.p.) administration were correlated with the tissue distribution of the compound and/or its metabolites. At all time intervals studied, 4, 8, 12, 24, 48, and 72 hr, the highest levels of concentration were found in the kidneys, liver, and adrenal glands. Cumulative urinary excretion represented about 66% of the dose at the 72 hr mark. Cumulative urinary excretion represented about 66% of the dose at the 72 hr mark. Cumulative fecal excretion was relatively insignificant, at less than 3% of the dose. It is suggested that excretion of EDB in the expired air also represents a significant route of excretion, accounting for about 10-12% of the dose. The tissues found to contain the highest levels of EDB and/or its metabolites were the same organs which have been reported to exhibit granular degeneration of parenchymal tissues following EDB administration. It is difficult to assess the significance of this finding to human health as inhalation appears to be the most likely route for both industrial and environmental exposure.

76-1297. Rogers, A.; Mellors, A.; Safe, S. (Guelph-Waterloo Cent. Grad. Work Chem., Dep. Chem., Univ. Guelph, Guelph, Ontario, Canada). **Lysosomal membrane labilization by DDT, DDE and polychlorinated biphenyls (PCB).** *Res. Commun. Chem. Pathol. Pharmacol.* 13(2): 341-344; 1976. (7 references)

The present study reports the lytic effects of PCB, DDT, and DDE on rat liver lysosomes in vitro. At high concentrations (2.0 m*M*) of DDT, Aroclor 1232, 1242, and 1254, the lytic activity approaches that of the detergent, Triton X-100. At lower concentrations (2.0 μM) all chlorinated pollutants with the exception of Aroclor 1232 and 1242 retained considerable lytic activity, and Aroclor 1254 was the most active labilizer. This data suggests there is no correlation between the degree of chlorination and lytic activity as Aroclor 1254 is the most active, and is a medium chlorinated PCB mixture. The association of the chlorinated aromatic pollutants with lysosomal membranes suggests that these chemicals may also interact with, and disrupt, other cellular membrane systems. Labilization of lysosomal membranes results in release of large numbers of hydrolytic enzymes which can result in considerable cellular damage. Therefore, in vitro destabilization of rat liver lysosomal membranes by PCB, DDT, and DDE may contribute to the hepatotoxicity which has been reported in in vivo experiments.

76-1298. Dimitrescu, E.; Pascovici, V. (ICSPC, Bucharest, Romania). **Eficacitatea unor noi insecticide indigene cu toxicitate redusa pentru om si animale, in com-**

baterea omizilor de tortricide si cotari. [Effectiveness of some domestic insecticides with low toxicity to humans and animals used to control tortricid and geometrid moths.] *Rev. Padurilor* 87(8): 359-361; 1972. (10 references) (Romanian)

Laboratory tests were conducted to determine the effectiveness of three organophosphorus insecticides manufactured in Romania: malathion or carbetox (malathion) (LD50 = 1375 mg/kg), dipterex (trichlorfon) (LD50 = 560-630), and fosfotox (LD50 = 250). All three insecticides have a low residual period of 15-20 days. The tests were conducted during the spring of 1971. Boxes containing the moths and freshly cut oak branches were sprayed with varying concentrations of the insecticides. Maximum efficiency against the tortricid moths was obtained with a 0.3-0.5 percent solution of carbetox, a 0.25-0.5 percent solution of dipterex, and a 0.075-0.1 solution of fostofox. Maximum effectiveness against the geometrids (genus Erannis) was obtained with a 0.3-0.6 percent concentration of carbetox.

76-1299. Ivie, G. W. (Vet. Toxicol. Entomol., Res. Lab., Agric. Res. Serv., College Station, TX 77840). **Epoxide to olefin: a noval biotransformation in the rumen.** *Science* 191(4230): 959-961; 1976. (15 references)

Studies with an insect juvenile hormone mimic and the insecticide dieldrin have shown that enzymatic processes in the rumen reduce the epoxide moiety in these compounds to an olefin. This reaction is apparently microbial in origin and does not involve an observable intermediate. Epoxide reductions in the digestive tract of ruminants and possibly other mammals may be important in the detoxication of biologically active epoxides, including pesticides, alkylating agents, and carcinogens. (Author abstract by permission. Copyright 1976 by the American Association for the Advancement of Science)

76-1300. Polster, M. (Dep. Hyg., Epidemiol., Microbiol., Med. Fac., J. E. Purkyne Univ., Brno, Czechol-stovakia). **On problems of toxicity of heptachlor residues.** *Scr. Med. Fac. Med. Univ. Brun. Purkynianae* 46(2): 71-77; 1973. (5 references)

The toxicity was studied of certain insecticides toward representatives of zooplankton, fish, and water mollusks. An attempt was made to standardize the conditions of toxicological determination of heptachlor and heptachlor-epoxide in water crustaceans of the genus Daphnia. This was done for the purpose of using the biological methods of analysis to signal the presence of toxic risk residual concentrations of these substances in surface waters. Heptachlor was used in three preparations: heptachlor, commercial, Czechoslovakia, 66.5%; heptachlor, commercial, USA, 74%; and heptachlor, pure, Czechoslovakia, 98%. The heptachlor-epoxide used was commercial, USA, 91%. *Daphnia magna* and *Tubifex tubifex* exhibited a high sensitivity to all types of heptachlor, with an LD50 of about 0.12 ppm, as was also noted with the heptachlor-epoxide. The fish *Lebistes reticulatus* and the water-snail *Planorbis corneus* reacted to a very low concentration of the listed insecticides. The best conditions for using this biological test for determining residues of heptachlor and/or of its metabolites were found in the water crustacean, *Daphnia magna*. Strict observance must be given to certain standard methodologic conditions.

76-1301. Shirasu, Y. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). **[Progress of toxicological studies.]** *Shokuhin Eisei Kenkyu (Stud. Food Hyg.)* 25(11): 871-885; 1975. (4 references) (Japanese)

The methods of toxicological tests and progress in the field, especially on pesticides for agricultural and food additives, were described. At first, study of their toxicity using good quality experimental animals under well-controlled conditions was emphasized, especially SPF animals in a barrier system. As for the acute toxicity tests, there is the problem of pesticide formulations containing more than two active ingredients. In Japan, toxicological tests for pesticides consist of general toxicity tests (acute, subacute, and chronic); special toxicity tests (effects on future generations, such as teratogenicity and reproduction inhibitory action, carcinogenicity, mutagenicity, inhalation toxicity, topical stimulation, allergy activity); tests of effects on functions of a living body (general pharmacological tests); and tests on the fate of pesticides in a living body (metabolism and accumulation in living body).

76-1302. Mathis, H. L.; Pant, C. P. (WHO Aedes Res. Unit, Bangkok, Thailand). **Mosquito susceptibility levels to seven new insecticides and their comparative toxicity to the guppy, *Poecilia reticulata*, in Bangkok, Thailand.** *Southeast Asian J. Trop. Med. Public Health* 5(2): 299-302; 1974. (3 references)

Seven new insecticides were tested in laboratory susceptibility tests against the common mosquitoes of Bangkok (*Culex pipiens fatigans* and *Aedes aegypti*) and in toxicity tests with the larvivorous guppy, *Poecilia reticulata*. The Fish Safety Factors (LC05 to fish/LC95 to the target mosquito species) were calculated. The performance of MOS 1155 (chlorpyrifos-methyl) and OMS 1211 (iodofenphos) compared quite favorably with that of fenthion and fenitrothion, and the Fish Safety Factors for the former two compounds were 922 and 6200 as compared with about 500 for the latter two. However, while the guppies showed a very high tolerance to technical grade iodofenphos (LC50 = 62 ppm), they were much more susceptible to the emulsifiable concentrate of this compound. It is concluded that chlorpyrifos-methyl and iodofenphos would be quite safe for use against mosquito larvae in habitats were the guppy is present.

76-1303. Tyunyayeva, G. N.; Minenko, A. K.; Pen'kov, L. A. (Inst. Agric. Cent. Regions Nonchernozem Zone, Nemchinovka, Moscow Oblast, USSR). **Effect of triflura-**

lin on the biological properties of soil. *Soviet Soil Sci. (Engl. Transl.)* 6(3): 320-324; 1974. (8 references)

Trifluralin was added at rates of 3, 6, and 8 kg/ha to cultivated Meadow-Bog and Humic Peat soils and immediately worked to a depth of 7-8 cm. Cabbage was planted in the soil on the following day, and mixed soil samples were taken for microbiological analysis 2 weeks, 1.5 months, and 3.5 months after herbicide application. At 3 kg/ha, trifluralin did not significantly alter the numbers of bacteria, actinomycetes, fungi, ammonifiers, or phosphorus-mineralizing microorganisms in either soil type. Nor did it change the biochemical activity of the soils. The effect of trifluralin on the soil microorganisms was generally manifested within 2 weeks after application. A 3- or 10-fold increase in the amount of trifluralin only slightly enhanced the low toxicity seen when the compound was used at the conventional rate.

76-1304. Kocmierska-Grodzka, D. (Dep. Pharmacol., Med. Sch., Bialystok, Poland). **Influence of trichlorfon and fractionated irradiation on hydroproteolytic activity of pancreas and intestinal tissues of rats.** *Strahlentherapie* 151(3): 278-284; 1976. (33 references)

Trichlorfon, given before fractionated irradiation, affects the hydroproteolytic activity of some intracellular enzymes in the pancreas and intestine of female Wistar rats. Trichlorfon was applied i.p. at 10.0 or 30 mg/kg during 10 days prior to fractionated irradiation (5 × 150R). In the pancreas the small dose of trichlorfon caused enhancement of lipase activity, while the larger one did not change the enzyme activity in this direction. Fractionated irradiation increased lipase activity nearly 3 times in the pancreas and about two times in the duodenum. In the remainder of the intestine and in the colon, postirradiation decrease of lipase activity was noted. Trichlorfon pretreatment caused a marked decrease in postirradiation enhancement of lipase activity in the pancreas, in the duodenum, and to a smaller extent in the rest of the intestine. No changes brought about by trichlorfon were noted in the colon. The smaller dose of trichlorfon increased acid phosphatase activity in the duodenum. The larger dose decreased acid phosphatase activity in the pancreas and the colon. Irradiation increased acid phosphatase in all tissues with the exception of the colon. Pretreatment with trichlorfon (10 mg/kg) increased enzymatic activity in the intestine. The larger dose decreased this enzymic activity. The smaller dose of trichlorfon caused ambivalent modification of β-glucuronidase activity in particular parts of the intestinal tract. It diminished enzyme activity in the pancreas and colon; enhanced such activity in the small intestine. The large dose decreased enzyme activity in pancreas and colon and increased such activity in the duodenum. Irradiation enhanced this activity in all tissues. The small dose of trichlorfon further increased enzymatic activity, except in the pancreas where a decrease was noted. Opposite effects were brought about by the larger dose of the insecticide. The small dose of trichlorfon evoked augmented catheptic proteolytic activity in a rather marked degree in the intestine and decreased the activity in the colon. Pancreatic activity was unchanged. The large dose of trichlorfon did not affect enzyme activity in the duodenum, but did decrease it in the colon and pancreas. Irradiation increased catheptic activity in the pancreas and decreased it in other tissues examined. The small dose of trichlorfon inhibited postirradiation increases of cathepsin in the pancreas, but increased the activity in the duodenum and colon. The larger dose inhibited proteolysis in the pancreas and in all parts of the intestine.

76-1305. Edwards, C. A. (Rothamsted Exp. Station, Harpenden, Hertfordshire, England). **Some effects of insecticides on Myriapod populations.** *Symp. Zool. Soc. London* 32: 645-655; 1974.)

The effects of aldrin, DDT, chlorfenvinphos, diazinon, disulfoton, parathion, and phorate on populations of Pauropoda, Symphyla, Diplopoda, and Chilopoda were studied in four field experiments. In each case, insecticide was applied as a surface spray or dust which was rotovated thoroughly into the soil. The plots were located in an arable field and in an old pasture. In the arable plots, aldrin almost eradicated the Pauropoda from the soil and DDT greatly decreased their numbers; the effects on the Symphyla were less marked. The number of pauropods was also decreased in the pasture plots by aldrin and DDT, and again the symphylid populations were much less seriously affected. The Diplopoda were also little affected by aldrin or DDT at 6 lb/acre, although their numbers were considerably reduced by DDT at 60 lb/acre. The Chilopoda were markedly reduced by both aldrin and DDT. The organophosphate insecticides markedly reduced the pauropod populations and reduced the symphylids by about 1/2; the symphylid populations recovered completely within 6 mo. The millipedes were little affected by any of the organophosphates.

76-1306. Jones, R. J.; Barrow, W. W. (Dep. Biol., Univ. Houston, Houston, TX 77004). **Growth response of a select bacterial population exposed to malathion.** *Tex. Rep. Biol. Med.* 32(3-4): 689-697; 1974. (11 references)

Freshwater samples from Hermann Park Lake in Houston, Texas were incubated with varying concentrations of malathion, malaoxon, malathion half-ester (monoacid), or malathion dicarboxylic acid (diacid) and the effects on the naturally occurring bacterial populations determined. Bacterial growth was not affected by 0.01% technical grade malathion (100 times the field concentration), whereas concentrations of 0.1% and 1% promoted bacterial growth. At a concentration of 5%, malathion was toxic to the bacterial populations. Several bacterial strains isolated from the naturally occurring populations were able to utilize malathion and malathion monoacid to support growth, whereas malathion diacid and malaoxon were toxic for one isolate. The observed bacterial utilization of malathion probably contributes greatly to the reduced persistence of this insecticide when it is employed to control mosquitoes.

76-1307. Kazanovskiy, E. S.; Tulupova, V. G. (Izhmo-Pechorsk Sci. Res. Station of Veterinary Science, Izhmo-Pechorsk, USSR). **Toksicheskoe deystvie famofosa na severnykh oleney. [Toxic effects of famophos on reindeer.]** *Veterinariya (Moscow)* 10: 98-100; 1975. (Russian)

The acute toxicity of famophos was studied in reindeer following i.m. injection of 10, 20, 40, and 60 mg/kg doses. Stimulation of the cholinergic systems, depression, defecation, spasms, tremor of the extremities, dyspnea, and profuse discharge from the mouth and were observed after poisoning with 40-60 mg/kg doses. One of the two animals treated with 60 mg/kg died in 4 days. No pronounced clinical symptoms of poisoning were observed in animals treated with 10 and 20 mg/kg. The rate of cholinesterase inhibition was a direct function of the dose administered, and correlated with the poisoning symptoms. It is not recommended to use reindeer meat for human consumption for 45 days after i.m. treatment with 20 mg/kg doses of famophos (famphur).

76-1308. Gladenko, I. N.; Shulyak, V. D.; Babiy, L. I.; Zaytseva, L. D. (V. I. Lenin Academy of Agricultural Sciences, USSR). **Izmeneniya v organizme ovets pri khronicheskoy intoksikatsii trolenom. [Effects on sheep of chronic trolene intoxication.]** *Veterinariya (Moscow)* 10: 101-102; 175. *(Russian)*

The effect of trolene (fenchlorphos), administered in boluses in daily doses of 2 and 5 mg/kg over 5 months, was studied on certain biochemical parameters of sheep. Reduced blood sugar level was observed between 1.5 and 2.5 months, and a tendency toward reduced lactic acid concentration in the blood was observed at different dates. The reduction of the ratio of lactic acid to pyruvic acid, and of the fructose diphosphate aldolase activity, observed at the end of the experiment, indicates increased intensity of oxidative reactions with slightly reduced glycolysis. Insignificant increase in the adenine nucleotides was observed in the 5 mg/kg group. Significant increase in the alkaline phosphatase activity was observed during the first and second months. Reduction in the plasma free SH-group level was observed after 3.5 months' poisoning. Reduction of the alanine aminotransferase and increased aspartate aminotransferase activity were observed. The findings indicate metabolic changes and cumulation of trolene in the organism without notable clinical symptoms of poisoning.

76-1309. Vaicum, L.; Eminovici, A. (Res. Design Inst. Water Resources Eng., Bucharest, Romania). **The effect of trinitro-phenol and γ-hexachlorocyclohexane on the biochemical characteristics of activated sludge.** *Water Res.* 8(12): 1007-1012; 1974. (9 references)

Three laboratory scale activated sludge units were operated over a period of 3 months and the chemical and biological characteristics of the sludge were monitored. Percent COD removal, catalase activity, and respiration rate decreased as increasing complexity of the substrates produced poorer settling sludges. Following the steady-state addition of 50 mg/l trinitrophenol to the acetate-fed sludge, all parameters except the concentration of anthrone-reactive substances decreased significantly; after 10 days, the COD removal efficiency and total protein content returned to control levels. At 200 mg/l, these parameters were irreversibly altered, and the relationship of the high molecular weight protein fraction to the low molecular weight fraction was reversed. Similar results were obtained when acetonitrile was fed into a unit receiving nutrient broth plus aniline feed. The treatment efficiency of a factory waste water was unaltered by up to 5 mg/l lindane, but the efficiency was lowered by 20% in the presence of 10 mg/l lindane. Again, lindane reversed the relationship of the two major protein fractions.

See also **76-1150** **76-1156** **76-1167**

76-1310. Grubic, Z.; Sketelj, J.; Brzin, M. (Inst. Pathophysiol., Univ. Ljubljana, Ljubljana, Yugoslavia). **Notes on the thin-layer chromatography radiometric assay of cholinesterase activity.** *Anal. Biochem.* 69(1): 306-309; 1975. (5 references)

The use of thin-layer chromatographic (TLC) plates was studied fbr the determination of acetylcholine (ACh) and butyrylcholine (BuCh) hydrolysis. With Eastman TLC plates, an aqueous solution of methanol afforded better and more rapid separation than did diluted ethanol. A mixture of ethanol, methanol, and water used as the mobile phase proved satisfactory for the determination of BuCh hydrolysis. The chromatographic separation of ACh and acetate in diluted methanol was strongly influenced by the ionic strength of the applied sample, low ionic strength being correlated with better separation on chromatography with 80% methanol. After chromatographic separation, a piece of the chromatographic strip carrying acetate was dropped into a vial and the radioactivity counted. The recovery of acetate was almost quantitative (97%) when the counting was done after 1 hr, but was only 90% when the counting was done immediately after the run. The TLC radiometric assay, Reineckate precipitation radiometric method of McCaman, and titrimetric method gave similar results when used to evaluate the chromatographic separation of unhydrolyzed ACh and acetate. It follows that Eastman TLC plates can also be used for the radiometric assay of cholinesterases.

76-1311. Dunlap, K. L.; Sandridge, R. L.; Keller, J. (Mobay Chem. Corp., New Martinsville, WV 26155). **Determination of isocyanates in working atmospheres by high speed liquid chromatography.** *Anal. Chem.* 48(3): 497-499; 1976. (3 references)

A high speed liquid chromatographic (HSLC) method is presented which should improve the sensitivity and precision of analyses of isocyanates in working atmospheres. The method is based on the determination of ureas formed from the reaction of the isocyanates with *N*-4-nitrobenzyl-*N*-*n*-propylamine. A 90-μl aliquot of the solution to be analyzed is injected into the liquid chromatograph. With a flow rate of 2 ml/min, a linear solvent program is used to separate the excess nitro reagent and the urea derivatives of isocyanates. The initial solvent composition is 0.8% absolute ethanol in hexane, and the final composition after 10 min is 8% absolute ethanol in hexane. Liquid pressure at a flow rate of 2 ml/min is approximately 300 psig. Thus it is necessary to use the high sensitivity noise filter to minimize the baseline noise on the Waters Associates pumps due to the low flow rate and pressure. Ultraviolet detector output is recorded on a 10-mV strip chart recorder at 0.5 inches/min. Peak areas for the urea derivatives of the isocyanates in the chromatograms are determined manually or electronically. Detection limits by this method for several isocyanates are: TDI, 0.005 mg/m^3 or 0.70 ppb; MDI, 0.005 mg/m^3 or 0.50 ppb; HDI, 0.010 mg/m^3 or 1.5 ppb; and Desmodur N, 0.10 mg/m^3. One limitation of this method is that it cannot be used in atmospheres which decompose the nitro reagent by oxidation or reduction. It is concluded that the HSLC method presented in this paper offers improved precision, greater simplicity, general applicability, and a significantly lower limit of detection than previously possible for the determination of isocyanates in the working atmosphere.

76-1312. Runser, D. J.; Frank, C. W.* (Dep. Chem., Univ. Iowa, Iowa City, IA 52242). **Plasma emission detection of chlorinated pesticides in inert matrices.** *Anal. Chem.* 48(3): 514-516; 1976. (13 references)

A radio-frequency electrodeless discharge cell used for studying the emission spectra of organic compounds as an emission source was studied to determine the feasibility of a one-step method of detecting chlorinated pesticides in inert matrices by monitoring the 2780-A CCl radical emission band. This study reports determinations of DDT in soil and alumina samples. By monitoring the 2777.68, 2778.76, 2786.67, and 2788.39-A transitions of the 2780-A band of the CCl radical emission, the presence or absence of DDT in the alumina and soil samples was confirmed. This method allows absolute detection limits of 5.9 μg for DDT-alumina samples, 8.2 μg for DDT-soil samples. No spectral interference was noted in this region. It was concluded that this single step technique which eliminated extraction, isolation, and pre-concentration may be a useful method for total carbon-chlorine content.

76-1313. Volpe, Y.; Mallet, V. N.* (Dep. Chem., Univ. Moncton, Moncton, New Brunswick, Canada). **A mechanism for the heat-induced fluorescence of coumaphos and related compounds and the identification of their metabolites in water.** *Anal. Chim. Acta* 81(1): 111-116; 1976. (10 references)

A simple method is proposed for the identification and determination of Potasan in technical coumaphos. The major fluorescent products of coumaphos and Potasan, after heat treatment on t.l.c., are identified as chlorferone and 4-methylumbelliferone, respectively, by i.r., m.s., t.l.c. and fluorescence spectral data. In water, coumaphos degrades into Coroxon, the oxygen analog, and chlorferone, the hydrolysis product. These three compounds can be determined simultaneously on the same chromatogram after extraction from water. (Author abstract by permission)

76-1314. Sidwell, J. A.; Ruzicka, J. H. A. (Dep. Ind., Lab. Gov. Chem., Cornwall House, London, England). **The determination of substituted phenylurea herbicides and their impurities in technical and formulated products by use of liquid chromatography.** *Analyst (London)* 101(1199): 111-121; 1976. (7 references)

The application of liquid chromatography to the identification and determination of the active ingredient and the impurities in phenylurea herbicides commonly employed in agriculture is described. Technical materials

are dissolved in dichloromethane and chromatographed on microparticulate silica with dichloromethane or dichloromethane-methanol as eluting agent, or on microparticulate silica bonded with octadecyltrichlorosilane with methanol-water as eluting agent. An initial extraction procedure is required for dispersible powders. Detection was by means of ultraviolet absorbance. (Author abstract by permission)

76-1315. Coburn, J. A.; Chau, A. S. Y. (Water Quality Branch, Canada Centre for Inland Waters, Burlington, Ontario, Canada). **Confirmation of pesticide residue identity. Part IX. Organophosphorus pesticides.** *Environ. Lett.* 10(3): 225-236; 1975. (8 references)

Utilizing the hydrolysis of the three organophosphorus pesticides, dyfonate, dichlorofenthion, cyanox, and pentafluorobenzyl bromide,to produce the phenolic or thiophenolic products, a selective and sensitive confirmatory procedure has been developed. Extraction and quantitation were carried out by flame photometric detector—gas liquid chromatography. Following this the pesticides were hydrolyzed in a 10% methanolic-potassium hydroxide solution. From this solution the phenolic hydrolysis products were then extracted and reacted with pentafluorobenzyl bromide to produce the pentafluorobenzyl ether derivatives. Subsequently, these derivatives are cleaned-up and fractionated on silica gel micro-column and analyzed by electron capture—gas liquid chromatography. Using this technique as low as 0.01 μg dyfonate and dichlorofenthion and 0.10 μg cyanox from a one liter water sample can be confirmed.

76-1316. Tewari, S. N.; Sharma, I. C. (Chem. Examiner's Lab., Agra, India). **TLC determination of endrin in biological tissues.** *Fresenius' Z. Anal. Chem.* 278: 127; 1976.

A rapid, sensitive, and accurate method is proposed for the isolation and determination of endrin in biological tissues. The tissue sample is homogenized with *n*-hexane and anhydrous sodium sulfate, heated, filtered, and extracted with *n*-hexane. The organic phases are combined and extracted three times with acetonitrile, diluted with water, and reextracted with *n*-hexane in the presence of saturated sodium sulfate solution. The residue is then dissolved in acetone and applied to the TLC plate, which is coated with silica gel G. Development is carried out with *n*-hexane/acetone and the spraying reagent is a 2% alcoholic solution of diphenylamine. After drying, the plate is irradiated with 254 nm UV light for 30 min. Green spots of endrin (*Rf* 0.58) will appear against a white background. Other chlorinated insecticides also give grey to green color spots with different *Rf* values. Recovery of 95% is obtainable and there is a linear relationship between concentration and spot area from 0.5-20.0 μg.

76-1317. Shankaranarayana, M. L.; Abraham, K. O.; Raghavan, B.; Natarajan, C. P. (Central Food Technol. Res. Inst., Mysore, India). **Analytical methodology in pesticide research.** *Indian Food Packer* 28(1): 65-78; 1974. (245 references)

About 120 pest control chemicals are used in India in attempts to protect crops and conserve foods postharvest by preventing and suppressing infestation by insects, fungi, and rodents. Of these 120 chemicals, about 40 pesticides are indigenously produced. The problems of pollution from such chemicals are well known and widespread. Pesticide residues have been found to some degree in a variety of food produce, wild life, human tissue, air, and water. The residues and their degradation products can endanger the public health, and thus there is a need to eliminate them from the environment. The fact that such residues are often present in trace concentrations (ppm or ppb) makes their isolation, separation, and analysis very difficult. The various steps in the analysis consist of sampling, sample preparation, extraction, clean-up, detection, determination, and confirmation of identity. The various analytical procedures employed include chemical reactions, chromatography (paper, thin layer, column, and gas liquid), spectrometry (UV, visible, IR, Raman, NMR, mass), and bioassay. Combination instruments such as gas chromatograph-mass spectrometer, gas chromatograph-infrared and gas chromatograph-laser raman, are gaining popularity as they provide definite structural characterization of the residues in a single instrument approach.

76-1318. Cochrane, W. P.; Greenhalgh, R. (Anal. Serv. Sect., Plant Prod. Div., Agric. Canada, Ottawa, Ontario, Canada). **Some response characteristics of the electrolytic conductivity detector in the pyrolytic mode to chlorine, nitrogen and sulfur compounds.** *Intern. J. Environ. Anal. Chem.* 3(3): 199-212; 1974. (8 references)

The applicability was studied and assessed of electrolytic conductivity (CCD) in the determination of pesticide compounds containing nitrogen, sulfur, chlorine, or various combinations of all 3 elements. Nine organophosphorus compounds were studied initially: triethyl phosphorothioate, diethyl phenyl phosphorothioate, diethyl *S*-ethyl phosphorodithioate, diethyl *S*-phenyl phosphorodithioate, dyfonate, malathion, thimet, disyston, and ethion. The results of the study indicate that the CCD response is directly proportional to the amount of sulfur present in the molecule. The precision of the replicate injection ranged from a low of 0.2% for diethyl phenyl phosphorothioate to a high of 3.1% for malathion. The effect of nitrogen was found to contribute a negative response in the region of 25 counts/pmol. In a further study of 6 pesticides containing sulfur and chlorine, trichloronat, ronnel, diallate, triallate, dursban, and zytron, an additive chlorine contribution of about 40 counts/pmol was obtained. To verify this additive effect of chlorine by direct measurement nine organochlorine insecticides were studied: α-BHC, γ-BHC, aldrin, endrin, dieldrin, heptachlor, heptachlor epoxide, oxychlordane, and *p,p'*-DDE. An average of 65 counts/pmol Cl was noted for the dimethanonaphthalenes such as aldrin, and 38 count-

s/pmol Cl with the methanoindenes such as heptachlor. In comparing the results of CCD with the flame photometric detector (FPD), CCD was more sensitive than the FPD to sulfur-containing compounds. Also, the precision between repeated injections with the CCD was slightly better than with the FPD, with references to thiocarbamate, triazine, and organophosphorus compounds. However, due to a high variation in precision the quantitative analysis of organochlorine pesticide residues using the CCD in the pyrolytic mode is not recommended.

76-1319. Daughton, C. G.; Crosby, D. G.; Garnas, R. L.; Hsieh, D. P. H.* (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Analysis of phosphorus-containing hydrolytic products of organophosphorus insecticides in water.** *J. Agric. Food Chem.* 24(2): 236-241; 1976. (37 references)

A new approach to the analysis of ionic dialkyl phosphates and triphosphates in large volumes of aqueous media by using Amberlite XAD-4 resin is presented. Recoveries for diethylphosphoric acid and diethylthiophosphoric acid at 0.01-0.1 ppm in 500 to 4000 ml of aqueous media were 100 and 85%, respectively; recoveries for dimethylphosphoric acid and dimethylthiophosphoric acid at 0.1 ppm in 500 ml of aqueous media were 50 and 97%, respectively. Several easy methods are described for the elimination of possible interference due to inorganic phosphate and the potential application for urine analysis is discussed. All four ionic dialkyl phosphates were shown to be nearly as inhibitory as parathion to human plasma cholinesterase. (Author abstract reprinted by permission of the American Chemical Society)

76-1320. Holt, R. F.; Pease, H. L.* (Biochem. Dep., Exp. Stn., E. I. du Pont de Nemours & Co. Inc., Wilmington, DE 19898). **Determination of oxamyl residues using flame photometric gas chromatography.** *J. Agric. Food Chem.* 24(2): 263-266; 1976. (1 reference)

Oxamyl (methyl *N'*,*N'*-dimethyl- *N*-[(methylcarbamoyl)oxy]-1- thiooxamimidate) residues in plant and animal tissues and in soil are determined by initial extraction with ethyl acetate, alkaline hydrolysis to the more volatile oximino fragment, and final determination by gas chromatography with sulfur-sensitive flame photometric detection. Method sensitivity is 0.02 ppm based on 25-g samples. Recoveries of added material average about 90% in the 0.02-10 ppm range. (Author abstract reprinted by permission of the American Chemical Society)

76-1321. Greenhalgh, R.; Marshall, W. D.; King, R. R. (Chem. Biol. Res. Inst., Agric. Can., Ottawa, Ontario, Canada). **Trifluoroacetylation of mesurol [4-methylthio-3,5-xylyl- *N*-methylcarbamate], its sulfoxide, sulfone, and phenol analogs for analysis by gas chromatography.** *J. Agric. Food Chem.* 24(2): 266-270; 1976. (14 references)

Reaction conditions are established for the trifluoroacetylation of Mesurol (methiocarb) and its metabolites, Mesurol sulfoxide and Mesurol sulfone, together with their respective phenol analogs. The reactions with Mesurol sulfoxide and its phenol are anomalous in that they yield di rather than mono TFA derivatives. This is due to initial reaction taking place at the sulfoxide moiety. The carbamate trifluoroacetyl sulfoxide undergoes rearrangement to form an alkyl trifluoroacetoxy derivative, whereas the phenol analog gives an aryl trifluoracetoxy derivative. The reaction of trifluoroacetic anhydride proceeds more slowly with the carbamate and phenolic moieties. Mass spectra, nuclear magnetic resonance, and infrared spectra data are used to deduce the structures of the compounds. All the trifluoroacetyl derivatives of Mesurol and its metabolites can be chromatographed by gas chromatography and detected by a flame photometric detector in S mode. Thus, trifluoroacetylation can be used for the quantitation of Mesurol and its metabolites or for confirmatory purposes. (Author abstract reprinted by permission of the American Chemical Society).

76-1322. Cheng, H. H.; Fuehr, F. (Dep. Agron. Soils, Washington State Univ., Pullman WA 99163). **Extraction of methabenzthiazuron from the soil.** *J. Agric. Food Chem.* 24(2): 421-424; 1976. (6 references)

A fourfold solvent extraction procedure involving the use of acetone-ethyl acetate and acetone-chloroform combinations was developed for quantitative extraction of the herbicide methabenzthiazuron (MBT) from the soil. The recovery of MBT from soils spiked with [^{14}C]MBT 1 day before extraction was consistently over 95%, with each of the first three extractions removing over 60% of the MBT present or remaining in the soil. After a MBT-treated soil was aged for 6 months, only 50-70% of the ^{14}C remaining in the soil could be extracted. However, over 90% of the ^{14}C in the extracts was identified as the parent MBT, and the pattern of MBT removal from the aged samples was similar to that from spiked samples. It appears that the unextracted ^{14}C is either tightly bound by soil components or partially metabolized and could no longer be extracted by this procedure. (Author abstract reprinted by permission of the American Chemical Society)

76-1323. Haneda, M.; Nawata, Y.; Hayashi, T.; Ando, K. (Res. Lab., Chugai Pharm. Co. Ltd., Takada, Toshima-ku, Tokyo, Japan). **Tetranactin, a new miticidal antibiotic. VI. Determination of dinactin, trinactin and tetranactin in their mixtures by NMR spectroscopy.** *J. Antibiot.* 27(7): 555-557; 1974. (5 references)

A simple method is presented to determine the composition of mixtures of tetranactin homologues by NMR spectroscopy. The standard samples used were fractionated by column chromatography. A Hitachi Perkin-Elmer model R-20A (60 MHz) NMR spectrometer was used with $CdCl_3$ solutions containing about 32 mg of sam-

ple. Spectrometric conditions were: sweep speed 250 sec/600 Hz, time constant 0.1 sec, H_1 level 5×10^3 μV, sensitivity 6.3×10, internal standard tetramethylsilane, at ambient temperature. Proton signals in the range of 0.5 to 2.0 were recorded 10 times repeatedly on the same paper. For 6 signals in the spectra, the peak heights from base line were measured with slide calipers. For convenience, observed spectra were normalized to that of the doublet methyl proton signals. Consequently normalized spectra are independent of the concentration of the sample. Scale factors for the normalized spectra of dinactin and trinactin compared to tetranactin were estimated separately with binary mixtures of standard samples by the least-squares method. In most cases the estimated compositions were with an average error of about 3 mole %. Unfractionated samples for which qualitative analyses were conducted by thin layer chromatography were treated as ternary and binary mixtures, respectively. A recovery test on an enriched sample was satisfactory. Accurate results were not obtained for mixtures which contained components in less than 10 mole %. In this study a small desk top computer was used for data processing and 5 signals selected as the optimum for a simple simultaneous determination of tetranactin homologues in their mixtures. This method could be used for NMR spectrometers capable of accumulation of spectra and calculation successively so that more accurate results could be obtained with less labor.

76-1324. Caissie, G. E.; Mallet, V. N. (Dep. Chem., Univ. Moncton, Moncton, New Brunswick, Canada). **The fluorimetric detection of pesticides on aluminium oxide layers.** *J. Chromatogr.* 117(1): 129-136; 1976. (14 references)

The detection of pesticides on aluminum oxide layers was evaluated with the expectation that some results could be applied eventually to residue analysis. A total of 61 pesticides were examined for fluorigenic properties. Those for which positive results were obtained include aminocarb, captan, coumaphos, difolatan, diphacinone, diquat, fuberidazole, guthion, landrin, meretin, mesurol, MGK repellent 11, mobam, morestan, paraquat, rotenone, salithion, and warfarin. The thin layers were prepared to a thickness of 250 μm. A 2-μl volume of a 1000 ppm solution of each pesticide and applied on a chromatogram by a micro-pipette. After observation under UV light, the chromatogram was heated at a specific temperature for a definite period. The chromatogram was again examined under UV light for fluorescence. Heat treatment of the chromatogram yields intensified fluorescence for most pesticides but the effect is much more noticeable for those which are originally barely or non-fluorescent. The combination of excitation and emission wavelength maxima is characteristic for each pesticide, making the detection very selective. Comparisons were made of various layers including the basic aluminum oxide layers, silica gel layers, and neutral aluminum oxide layers. The pesticides captan, difolatan, diquat, and paraquat are fluorescent on aluminum oxide layers and not on silica gel layers under ordinary conditions. Analytical procedures for determining these fluorescent pesticides in environmental samples are under study.

76-1325. Crist, H. L.; Moseman, R. F. (Environ. Toxicol. Div., Health Effects Res. Lab., Research Triangle Park, NC 27711). **Improved recovery of hexachlorobenzene in adipose tissue with a modified micro multiresidue procedure.** *J. Chromatog.* 117(1): 143-147; 1976. (6 references)

A micro multiresidue procedure for recovery of low concentrations of hexachlorobenzene from fat was investigated using acetonitrile to extract the pesticide. The acetonitrile was then diluted with a 2% sodium sulfate solution and the pesticides were partitioned into hexane. The results were disappointing with recoveries only in the 60-65% range. However, the use of 20% acetone in acetonitrile (v/v) as the extracting solvent produced a marked improvement in the recovery of HCB without sacrificing recovery for other common chlorinated pesticides. About 500 mg of rendered chicken fat was extracted in a tissue grinder with 2.5 ml of 20% acetone in acetonitrile. The sample was centrifuged; the supernatant transferred to a 50 ml round-bottom tube containing 25 ml of 2% sodium sulfate solution. The sample was extracted twice more, centrifuged, and transferred to the 50-ml tube. Partitioning was done by adding 4 ml hexane and shaking vigorously for 2 min. After the phases separated the top layer was transferred to a 25-ml concentrator tube. The extract was partitioned two additional times with 3 ml hexane each time. The solvent was evaporated to 0.3 ml under nitrogen on a water-bath or steam-bath using a micro Snyder column. The sample was transferred with hexane to a 200 mm Chromaflex column containing 1.6 g Florisil topped with 1.6 g sodium sulfate. The column was eluted with 12 ml hexane followed by 12 ml 1% methanol in hexane and finally with 12 ml 1% methanol in hexane. The eluates were collected in 25-ml concentrator tubes and evaporated to 1.0 ml. The second fraction from the Florisil column was reduced to 0.5 ml and eluted through a 200 mm column containing 5 g MgO-Celite (1:1) with 70 ml petroleum ether. This removes excessive amounts of interfering material. Recovery reached 88.0%. The recoveries of selected pesticides from chicken fat using the modified micro multiresidue procedure were: β-HCH, 89.6%; aldrin, 88.2%; *p,p'*-DDD, 104.2%; heptachlor epoxide, 93.5%; dieldrin, 93.6%, *p,p'*-DDT, 97.8%; and *p,p'*-DDE, 93.3%.

76-1326. Krijgsman, W.; Van de Kamp, C. G. (Lab. Toxicol., Natl. Inst. Public Health, Bilthoven, The Netherlands). **Analysis of organophosphorus pesticides by capillary gas chromatography with flame photometric detection.** *J. Chromatogr.* 117(1): 201-205; 1976. (4 references)

A method is presented for the analysis of organophosphorus pesticides using capillary gas chromatography with flame photometric detection. A Tracor Model

550 instrument, equipped with a flame photometric detector, was modified for capillary column operation. The gas chromatographic conditions were: Pyrex, length 50 m, I.D. 0.35 mm; phase, SE-30 (GC grade). Restriction coil: stainless steel, length 1.40 m, I.D. 0.25 mm. Temperatures: oven, 200° and 240°; detector, 210°. Gas flows: carrier gas (helium) 4 ml/min; splitting gas (helium) 24 ml/min; detector, hydrogen 200 ml/min, air 80 ml/min, oxygen 10 ml/min; purge gas (nitrogen) 60 ml/min. Injection: 1 μl of mixtures of the organophosphorus pesticides in acetone-light petroleum were injected through a septum on to the column. Retention times of pesticides relative to parathion are given for: trichlorfon, TEPP, naled, dichlorvos, mevinphos, heptenophos, zinophos, omethoate, prophos, bidrin, sulfotep, butonate, dimethoate, thiometon, AC 92.100, diazinon, cyanthoate, dyfonate, disulfoton, formothion, dichlofenthion, parathion methyl, phosphamidon, prothoate, fenchlorphos, fenitrothion, pirimiphos methyl, malathion, dursban, parathion, bromophos, pirimithate, trichloronate, mecarbam, Bay 77049, chlorfenvinphos, fenthoate, ciodrin, supracide, vamidothion, Bay 77488, tetrachlorvinphos, bromophos ethyl, plondrel, triamiphos, ethion, triazophos, carbophenothion, menazon, imidan, phencapton, EPN, azinphos methyl, phosalone, azinphos ethyl, W 11099, dialifor, coumaphos, and abate. The detection limit for the phosphorus esters with a relative retention time of about 1 in the programmed mode is about 100 pg.

76-1327. Klisenko, M. A.; Shmigidina, A. M. (Author address not given). **Opredelenie ostatochnykh kolichestv dinitroortokrezola v urozhae. [Determination of residual quantities of DNOC in crops.]** *Khim. Sel'sk. Khoz.* 13(11): 814-815; 1975. (5 references) (Russian)

A thin-layer chromatographic method is described for the quantitative determination of DNOC in plant materials (grapes, apples, potatoes). Following extraction with sodium hydroxide and reextraction with diethyl ether, the residue is applied on zinc dust-containing silica gel layer for visualization with chloroform-methanol (9:1) and *n*-dimethylaminobenzaldehyde with glacial acetic acid. DNOC appears in the form of reddish orange spots with Rf 0.22-0.25. At a recovery rate of 80-85%, the sensitivity of the method is 0.04 mg/kg or 2 μg per sample.

76-1328. Kazanovskiy, E. S. (Izhmo-Pechorsk Sci. Res. Station of Veterinary Science, Izhmo-Pechorsk, USSR). **Ochistka ekstraktov pri opredelenii fosfororganicheskikh insektitsidov v tkanyakh i organakh zhivotnykh. [Purification of extracts for the determination of organophosphorus insecticides in animal tissues and organs.]** *Khim. Sel'sk. Khoz.* 13(11): 815-816; 1975. (Russian)

A method is described for the removal of fats and waxes from organophosphorus insecticide-containing extracts of animal tissues and organs. After extraction with chloroform or acetone, reextraction is done with a mix of acetone and water in which lipids are insoluble. A few drops of 19% aqueous solution of acetic acid are added in the case of organophosphorus insecticides that readily hydrolyze in neutral or slightly alkaline medium. Following adsorption on alumina and elution with chloroform or another water-insoluble solvent, determination is done on silica gel or alumina layer. Laboratory tests with baytex and trichlorfon showed good reproducibility of the method. The recovery rate is at least 80%.

76-1329. Abbasov, T. G. (All-Union Sci. Res. Inst. of Veterinary Hygiene, USSR). **Opredelenie ostatochnykh kolichestv metilnitrofosa v myase, moloke i yaytsakh metodom gazozhidkostnoy khromatografii. [Determination of residual quantities of methylnitrophos in meat, milk, and eggs by gas-liquid chromatography.]** *Khim. Sel'sk. Khoz.* 13(11): 816; 1975. (Russian)

A gas-chromatograpic method is described for the extraction of methylnitrophos in meat, milk, and eggs. After extraction with acetone, reextraction is done with *n*-hexane from the acetone-water mixture. Determination is done on a chromatograph with methylsiloxane SE-30-filled column with electron capture detector. At a column length of 1,500 mm, the retention time is 1.5 min at 180°C, and 4.9 min on a 3,000 mm column at 220°C. The recovery rate is 85±5% from milk, 88±5% from meat, and 78±3% from eggs. The sensitivity of the method amounts to 0.2 ng in 5 μl sample, or 0.02 mg/kg for milk and meat, and 0.04 mg/kg for eggs.

76-1330. Samosvat, L. S.; Todua, N. A. (Kiev State Inst. Postgrad. Training Physicians, Kiev, USSR). **Opredelenie ostatochnykh kolichestv tordona v vode i plodakh metodom tonkosloynoy khromatografii. [Thin-layer chromatographic method for the determination of picloram in water and fruits.]** *Khim. Sel'sk. Khoz.* 13(11): 816-817; 1975. (2 references) (Russian)

Methods for the extraction and thin-layer chromatographic determination of picloram in water and in fruits is described. For extraction from water, orthophosphoric acid is added, and extraction is done three times with 1:3 mixture of acetone and chloroform. Determination is done on silica gel, using 17 : 7.5 ratio of chloroform and glacial acetic acid as a mobile phase, and silver nitrate, potassium iodide, and starch for visualization. The sensitivity amounts to 0.5 μg. Following alkaline extraction, further clean-up is done in the same manner for determination in apples and pears. Acetone and chloroform (1:3) are used for extraction from tangerines, and clean-up is done with chloroform, sodium hydroxide, and charcoal. At a recovery rate of 70-80%, the sensitivity amounts to 0.01-0.02 mg/kg (apples, pears) and to 0.02 mg/kg (tangerines).

76-1331. Ali, K. A.; Nair, M. R. G. K. (Tamil Nadu Agric. Univ., Coimbatore, India). **Microbioassay of endrin residues on rice. I. Standardization of a microbioassay**

technique. *Madras Agric. J.* 60(7): 436-438; 1973. (5 references)

First instar larvae of *Corcyra cephalonica* St. (Galleriidae) were added to wheat flour treated with endrin (5.2-12.4 ppm) dissolved in rice plant extract and the 24 hr mortality data was recorded. The technique proved reliable and highly sensitive; the LD50 values of the four experimental replications were 1.81, 1.88, 1.78, and 1.74 ppm, respectively. The larvae responded to endrin concentrations as low as 5 ppm. In one experiment, the effect of variations in the quantity of plant extracts (plant material extracted with acetone) was determined on the toxicity of endrin. The percentage mortality was not affected materially by increasing the plant material extracted from 10 to 40 g.

76-1332. Verma, B. C.; Kumar, S. (Dep. Chem., Punjabi Univ., Patiala, Punjab, India). **Non-aqueous redox titrations with iodine and iodine halides. Determination of xanthates and dithiocarbamates.** *Microchim. Acta* 1(2-3): 209-215; 1976. (12 references)

A procedure is suggested for the direct nonaqueous visual and potentiometric determination of xanthates and dithiocarbamates with iodine and iodine halides (monobromide, monochloride, and trichloride). Acetonitrile is used both as solvent for the preparation of each oxidant solution and as the titration medium. The determination of xanthates and dithiocarbamates with iodine is based on their oxidation is brought about by iodine which is formed as an intermediate during the titrations. The formation and consumption of iodine is visually detected by the appearance of yellow iodine coloration before the end point; the end point is detected by the first permanent yellow coloration. The results with a variety of xanthates of dithiocarbamates were highly reproducible. Inflection points and potential jumps are presented as obtained in the potentiometric titrations of xanthates and dithiocarbamates with iodine monobromide in acetonitrile.

76-1333. Zimmerli, B.; Marek, B. (Eidgenoessisches Gesundheitsamt, Bern, Switzerland). **Versuche zur raschen Reinigung pestizidhaltiger Extrakte mittels Hochdruck-fluessigkeitschromatographie. [Investigations in the rapid purification of pesticide-containing extracts by means of high pressure liquid chromatography.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 66(3): 362-378; 1975. (40 references) (German)

Various methods for the clean-up of plant extracts for gas chromatography were screened, and the most suitable was found to be high pressure liquid chromatography (HPLC). The apparatus selected was Waters Associates Type ALC 201, which makes use of a porous silica gel (Porasil A). The eluant selected was hexane/methylene chloride 9:1 (v/v). A series of tests were run with chlorinated hydrocarbons in sunflower oil with the following results (pesticide, content in ppb, % recovery): HCB, 39, 80.1; α-HCH, 22, 82.4; β-HCH, 216, 84.1; γ-HCH, 97, 86.4; *p,p'*-DDE, 111, 82.2; *p,p'*-TDE, 103, 89.4; *p,p'*-DDT, 443, 87.7; dieldrin, 113, 84.0; endrin, 134, 89.7. Up to 50 mg of the lipids per gram of adsorbent can be applied to the HPLC column.

76-1334. Alford, A. L. (Natl. Environ. Res. Cent., Athens, GA). **Evaluation of a computer program for GC-MS specific ion monitoring.** *Natl. Tech. Inform. Serv.*, PB-240 124, 1974, 27 p.

An evaluation was made of a computer program, Specific-Ion Mass Spectrometric Detection for Gas Chromatographic Pesticide Analysis (SIM), using standard solutions of 4 chlorinated pesticides. A Finnigan 1015 S/L electron-impact quadrupole mass spectrometer was operated at the following conditions: 70eV electron energy, ppm sensitivity range, and 450 μa ionizing current. A modified Varian 1400 gas chromatograph was interfaced to the spectrometer. The chromatograph was filled with a 6 ft × 0.25 in (O.D.) glass column packed with 3% Silar on 80-100 mesh Gas Chrom Q. The column was operated at 240°C isothermal with helium flowing at about 18 ml/min. Data acquisition and processing were controlled by System Industries System/150, which interfaced the mass spectrometer with a 4K Digital Equipment Corporation PDP 8/e computer. A stock solution of 4 pesticides, *o,p'*-DDD, *p,p'*-DDT, DDE, and dieldrin was prepared with 10 mg of each in 1 liter of hexane. Aliquots were diluted to give solutions of 5 ng/μl, 1 ng/μl, 0.5 ng/μl, and 0.2 ng/μl. Using data obtained for these solutions, the SIM program and standard System/150 specific-mass detection were compared. After satisfactory chromatographic conditions were established for the mixture, a complete mass spectrum was obtained for each compound. Both *p,p'*-DDT and *o,p'*-DDD had base peaks at m/e 235 and 67% fragments at m/e 237. Background ions with these m/e values were insignificant. The third most intense peak in both spectra was m/e 165 but a significant background contribution prevented monitoring this ion. For *p,p'*-DDE, a unique base peak of m/e 246 along with a strong m/e 248 (65% of base peak) provided excellent specificity and sensitivity. No ideal ion was found to monitor dieldrin. Mass 263, although only 5% of base peak intensity, was used to monitor dieldrin, because the background ions at mass 263 were insignificant.

76-1335. Seguchi, K.; Sekiguchi, M.; Inada, S.; Asaka, S. (Ageo Res. Lab., Nippon Kagaku Co. Ltd., Ageo, Saitama, Japan). **[Residue analysis of phenproxide (NK-493) and its metabolites.]** *Noyaku Kagaku (J. Pestic. Sci.)* 3(3): 137-144; 1976. (17 references) (Japanese)

Residue analysis methods of a recently developed acaricide, phenproxide (4-chloro-3-*n*-propylsulfinylphenyl 4-nitrophenyl ether), and its presumed metabolites were studied by ECD-gas chromatography. Of the presumed metabolites, the sulfoxide and the amino derivatives must be transformed to appropriate derivatives. After extracting residual phenproxide and its

metabolites in crops with methanol, extract clean-up by hexane, transfer to benzene, and oxidation, reduction, and trifluoroacetylation were carried out on the compounds. The respective derivatives were separated by column chromatography, then the separated components were determined by ECD-gas chromatography. By utilizing acetyl chloride as a reducing agent, it was possible to determine the parent compound, phenproxide, and six presumed metabolites. It was found that most phenproxide applied on plants remained as it was, giving 5-10% phenproxide sulfone,with minute amounts of the sulfide and the amino sulfoxide. The total recovery ranged between 76.5 and 103% when the specimen was fortified with 0.05-0.2 ppm phenproxide. The detection limit was 0.001-0.003 ppm.

76-1336. Anonymous. (Agric. Chem. Inspect. Stn., Minist. Agric. and For., Kodaira, Tokyo, Japan). [**Official methods of inspecting agricultural chemicals. Part 30. PMP 50% WP, captan WP, folpet 50% WP, and benthiocarb herbicide EC.**] *Noyaku Kagaku (J. Pestic. Sci.)* 3(3): 153-156; 1976. (Japanese)

Official methods are described of inspecting (confirming the indicated active ingredient (a.i.) content) four pesticide formulations. Method summaries follow: (1) PMP 50% (a.i. is *O,O*-dimethyl *S*-phthalimidomethyl dithiophosphate). The a.i. is extracted with acetone and the extract is decomposed by ethanolic soda and the product is reacted with cupric sulfate. Total dithiophosphoric ester in the reaction product is determined by extinction at 420 nm. From this, the free dithiophosphoric ester was subtracted to obtain the amount of PMP in the specimen. The values obtained by three analysts from the same specimen were 51.3, 51.4, and 51.3% (average of 5 determinations), respectively. It is preferable to keep the solution at 5 C for coloring.(2) Captan WP (formulations containing 50 and 80% a.i., respectively). The a.i. (*N*-trichloromethylthiotetrahydrophthalimide) is extracted from the specimen with chloroform, and the content of a.i. is determined by HFD-gas chromatography. A chromatographic column consisting of silicone rubber SE 52 on 3% Chromosorb G(AW-DMCS) of 60-80 mesh is used. The recovery from the prepared formulation was 99.7%. The values obtained by three analysts from the same specimen were 81.7, 81.5, and 81.1% (average of 5 determinations). This method is simpler and more rapid than the colorimetric method and has the same degree of accuracy. (3) Folpet 50% WP (a.i. is *N*-trichloromethylthiophthalimide). The a.i. in the formulation is extracted with chloroform, and that in the extract is determined by HFD-gas chromatography. A chromatographic column consisting of silicone rubber SE 52 on 3% Chromosorb G(AW-DMCS) of 60-80% mesh was used. The recovery from the prepared formulation was 99.7%. The values obtained by two analysts were 52.6 and 53.2%, respectively. When compared to the colimetric method, accuracy was almost the same (53.2% vs. 53.9%). (4) Benthiocarb herbicide EC (a.i. is *S*-(4-chlorobenzyl) *N,N*-diethylthiocarbamate). The a.i. is extracted from the formulation with acetone, and then determined by HFC-gas chromatography with benzyl benzoate as an inner standard. The ratio of heights of the two is used for purposes of determination. However, the present method is not necessarily applicable to all cases, and the range of concentrations of the a.i., which makes the linear calibration curve is relatively narrow. The values obtained by two analysts were 52.8 and 52.7%, respectively. The gas chromatographic column consisted of silicone OV-17, 2% Chromosorb G(AW-DMCS) of 60-80% mesh.

76-1337. Kashi, K. P.; Muthu, M. (Central Food Technol. Res. Inst., Mysore 570013, India). **A mixed indicator strip for phosphine detection.** *Pestic. Sci.* 6(5): 511-514; 1975. (6 references)

A rapid, sensitive, and reliable mixed indicator paper strip impregnated with dimethyl yellow (0.05%), cresol red (0.1%), and mercuric chloride (1.0%) in methanol has been developed for the detection of phosphine (PH_3) in air at the permissible level (TLV). The paper strip turns red in the presence of phosphine. It is highly sensitive and has better shelf-life than indicator strips impregnated with dimethyl yellow plus mercuric chloride or cresol red plus mercuric chloride. (Author abstract by permission)

76-1338. Beynon, K. I.; Wright, A. N. (Shell Res. Ltd., Woodstock Lab., Sittingbourne, Kent, England). **An improved method for the analysis of trifenmorph in water.** *Pestic. Sci.* 6(5): 515-523; 1975. (4 references)

The colorimetric method for the analysis of the molluscicide trifenmorph (*N*-tritylmorpholine) in water has been extended to allow analysis of trifenmorph alone under field conditions. A simple chromatographic stage has been used to reject the hydrolysis product triphenylmethanol. The modified procedure has been useful in the field during recent applications of trifenmorph. (Author abstract by permission)

76-1339. Sasaki, K.; Takeda, M.; Uchiyama, M. (Natl. Inst. Hyg. Sci., Tokyo, Japan). [**Studies on the analysis of pesticide residues in foods. Part 19. Method of determination of dithiocarbamate fungicide residues in agricultural products.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 17(1): 72-77; 1976. (17 references) (Japanese)

Determination of residues of dithiocarbamate fungicides, such as zineb, maneb, mancozeb, and polycarbamate in agricultural products, such as summer orange, tomato and cucumber fruits, potato, and onion, was made by carbon disulfide-FPD gas chromatographic and ethylene diamine-ECD gas chromatographic methods. The first method depends on the gas chromatograph of carbon disulfide, formed by decomposing dithiocarbamate with acid, which is simple and easy without any interfering peaks in the chromatogram. The second

method depends on the reaction of ethylene diamine, formed by decomposing dithiocarbamate simultaneously with carbon disulfide and methyl trifluoroacetate, and the ECD-gas chromatography of the formed thylene bis(trifluoroactoamide). According to the determination of the above-mentioned fungicides in 5 kinds of agricultural products, recovery was between 75.5% and 91.0% in the first method. Recovery of fortified zineb in the products ranged between 69.5 and 105%.

76-1340. Cheng, H. H.; Farrow, F. O. (Dep. Agronomy Soils, Washington State Univ., Pullman, WA 99163). **Determination of ^{14}C-labeled pesticides in soils by a dry combustion technique.** *Soil Sci. Soc. Am. J.* 40(1): 148-150; 1976. (4 references)

A dry combustion method for the oxidation of ^{14}C-labeled pesticides in soils and the determination of total ^{14}C has been devised. Six soil samples were used in the study, along with 3 pesticides, 2,4-D, picloram, and methabenzthiazuron. The method is a modification of a procedure using a Leco high-temperature induction furnace for oxidation and determination of total C in soils. In this modified system, the carbon dioxide evolved from the sample oxidation is trapped in a NaOH solution, which can then be analyzed for total ^{14}C radioassay and for total C by titrimetry. In addition to the reliability of this method, it is also simple and flexible. It requires only one weighing of the soil sample directly into the combustion crucible without the need of mixing with catalysts. No manual manipulation is needed during the combustion operation. A single gas-washing bottle for trapping carbon dioxide in sodium hydroxide solution proved sufficient.

76-1341. Pisklov, V. P. (A. I. Mikoyan All-Union Sci. Res. Inst. of Tobacco and Makhorka Growing, USSR). **Soderzhanie ostatkov tsineba i produktov ego piroliza v tabachnom dyme. [Content of residues of zineb and products of its pyrolysis in tobacco smoke.]** *Tabak (Moscow)* 1: 35-36; 1974. (Russian)

Residues of zineb and of products of its pyrolysis (hydrogen sulfide and carbon disulfide) were studied in tobacco smoke. Cigarettes made of tobacco with 6 mg/kg zineb, obtained from tobacco plants sprayed with 0.5% zineb suspension, and cigarettes with artifically increased zineb residue levels were investigated. Zineb residues were not detected in the cigarette smoke. Correlation was established between the zineb residue level in tobacco and the content of hydrogen sulfide (0.842) and carbon disulfide (0.999) content in the tobacco smoke. While the carbon disulfide residue in the smoke of residue-free tobacco was below the detection limit of 1.5 μg/l, it reached 161 μg/l at a zineb residue content of 2,712 μg/cigarette. The hydrogen sulfide concentration in the smoke was 143 μg/l for residue-free tobacco, and only slightly higher (188 μg/l) for tobacco with 2,712 μg of zineb. The increase in the carbon disulfide to hydrogen sulfide ratio from 0.05 to 0.86 with increasing zineb residue in the tobaccos from 113 to 2,712 μg/g cigarette indicates that carbon disulfide is formed primarily at high temperature. Over 10% of the carbon carbon disulfide that can be theoretically formed from the zineb residue is assumed to be present in the central stream of the smoke. Hydrogen sulfide is most probably formed from carbon disulfide in the presence of water at temperatures above 150°C.

76-1342. Yarotskiy, F. A.; Efimov, N. P. (Veterinary Station, Mogilev Region, USSR). **Opredelenie geksakhlorparaksilola v moloke. [Determination of hexachloro-*p*-xylene in milk.]** *Veterinariya (Moscow)* 11: 77-78; 1975. (Russian)

Problems are discussed involved in the determination and identification of the anthelmintic hexachloro-*p*-xylene and its metabolites in milk. The chromatographic spots of the metabolites and technical impurities can hardly be distinguished from those of DDT and BHC isomers by the conventional thin-layer chromatographic method. Separative chromatography, using *n*-hexane for elution from scraped-off adsorbent layer, permits differentiation between hexachloro-*p*-xylene (whose spot is located at the solution front), its metabolites, and DDT and BHC isomers. Hexachloro-*p*-xylene was mistakenly identified as DDT and BHC in milk following anthelminthization of cows with this preparation.

76-1343. Konyukhov, A. F. (All-Union Inst. of Experimental Veterinary Sci., USSR). **Opredelenie amifosa v kombikormakh. [Determination of amiphos in mixed feed.]** *Veterinariya (Moscow)* 11: 83-84; 1975. (Russian)

A thin-layer chromatographic method is described for the determination of amiphos residues in mixed feed. After extraction with acetone, distilled water, and chloroform, the chloroform extract is applied on KSK silica gel layer for visualization with 1:1 ratio of chloroform and acetone, bromophenol blue, and silver nitrate. Qualitative and quantitative determination is done against a standard solution. Amiphos appears on the plate in the form of a dark blue spot with Rf 0.60±0.02. The sensitivity of the method is to 0.1 mg/kg. The recovery rate is 82±16%.

See also **76-1108** **76-1111** **76-1145**

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